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March 2010

Draft Environmental Impact Report

Volume 1 of 3

For the
San Francisco Public Utilities Commission's

LOWER CRYSTAL SPRINGS DAM IMPROVEMENTS PROJECT

San Francisco Planning Department Case No. 2006.0536E
State Clearinghouse No. 2007012002

Draft EIR Publication Date: March 2, 2010
Public Hearing Date: April 6, 2010, Hillsborough
Public Hearing Date: April 8, 2010, San Francisco
Public Comment Period: March 2, 2010 to April 16, 2010

City and County of San Francisco
San Francisco Planning Department

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TO: Distribution List for the Lower Crystal Springs Dam Improvements Project Draft EIR

FROM: Bill Wycko, Environmental Review Officer

SUBJECT: Draft Environmental Impact Report for the Lower Crystal Springs Dam Improvements Project (Planning Department File No. 2006.0536E)

This is the Draft Environmental Impact Report (EIR) for the Lower Crystal Springs Dam Improvements Project. A public hearing will be held on the adequacy and accuracy of this document. After the public hearing, our office will prepare and publish a document titled "Comments and Responses," which will contain all relevant comments on this Draft EIR and our responses to those comments. It may also specify changes to this Draft EIR. Those who testify at the hearing on the Draft EIR will automatically receive a copy of the Comments and Responses document, along with notice of the date reserved for certification; others may receive a copy of the Comments and Responses and notice by request or by visiting our office. This Draft EIR together with the Comments and Responses document will be considered by the Planning Commission in an advertised public meeting and will be certified as a Final EIR if deemed adequate.

After certification, we will modify the Draft EIR as specified by the Comments and Responses document and print both documents in a single publication called the Final EIR. The Final EIR will add no new information to the combination of the two documents except to reproduce the certification resolution. It will simply provide the information in one document, rather than two. Therefore, if you receive a copy of the Comments and Responses document in addition to this copy of the Draft EIR, you will technically have a copy of the Final EIR.

We are aware that many people who receive the Draft EIR and Comments and Responses have no interest in receiving virtually the same information after the EIR has been certified. To avoid expending money and paper needlessly, we would like to send copies of the Final EIR in Adobe Acrobat format on a compact disk (CD) to individuals only if they request them. Therefore, if you would like a copy of the Final EIR, please fill out and mail the postcard provided inside the back cover to the Major Environmental Analysis division of the Planning Department within two weeks after certification of the EIR. Only those requesting a Final EIR by that time will have a copy mailed to them.

Thank you for your interest in this project.

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TABLE OF CONTENTS

Lower Crystal Springs Dam Improvements Draft EIR

Page

Volume 1

Acronyms and Glossary ix

1. Summary **1-1**
1.1 Introduction and Purpose of the Project 1-1
1.2 Overview of the SFPUC Regional Water System 1-2
1.3 Project Background and Objectives 1-8
1.4 Project Description 1-9
1.5 Summary of Project Environmental Impacts and Mitigation Measures 1-12
1.6 Alternatives to the Proposed Project 1-13
1.7 Significant and Unavoidable, and Potentially Significant and Unavoidable Impacts of the Proposed Project 1-14
1.8 Areas of Controversy 1-14
1.9 References 1-29

2. Introduction and Background **2-1**
2.1 Introduction 2-1
2.2 Background—WSIP and the Regional Water System 2-1
2.3 Purpose of this EIR 2-9
2.4 CEQA Process and Public Outreach 2-10
2.5 Organization of this EIR 2-14
2.6 References 2-15

3. Project Description **3-1**
3.1 Introduction and Summary 3-1
3.2 Project Location 3-2
3.3 Project Goals and Objectives 3-4
3.4 Existing Facilities and Current Operations at Lower Crystal Springs Dam 3-6
3.5 Project Components 3-13
3.6 Project Construction 3-18
3.7 Operations and Maintenance of Lower Crystal Springs Dam and Crystal Springs Reservoir 3-37
3.8 Coordination with Other Local Projects 3-39
3.9 Required Permits and Approvals 3-41
3.10 References 3-43

Page

Volume 1 (continued)

4. Plans and Policies **4-1**
- 4.1 Overview 4-1
- 4.2 Plans and Policies Relevant to the Project 4-2
- 4.3 Plan Consistency Evaluation 4-12
- 4.4 References 4-18

5. Environmental Setting, Impacts, and Mitigation Measures
- 5.1 Overview 5.1-1
  - 5.1.1 Scope of Analysis 5.1-1
  - 5.1.2 Significance Determinations 5.1-2
  - 5.1.3 Relationship to the WSIP 5.1-3
  - 5.1.4 Cumulative Impacts 5.1-5
  - 5.1.5 References 5.1-29
- 5.2 Land Use 5.2-1
  - 5.2.1 Setting 5.2-1
  - 5.2.2 Regulatory Framework 5.2-4
  - 5.2.3 Impacts and Mitigation Measures 5.2-5
  - 5.2.4 References 5.2-12
- 5.3 Aesthetics 5.3-1
  - 5.3.1 Setting 5.3-1
  - 5.3.2 Regulatory Framework 5.3-13
  - 5.3.3 Impacts and Mitigation Measures 5.3-16
  - 5.3.4 References 5.3-40
- 5.4 Population and Housing 5.4-1
  - 5.4.1 Setting 5.4-1
  - 5.4.2 Regulatory Framework 5.4-1
  - 5.4.3 Impacts and Mitigation Measures 5.4-1
  - 5.4.4 References 5.4-3
- 5.5 Cultural and Paleontological Resources 5.5-1
  - 5.5.1 Setting 5.5-1
  - 5.5.2 Regulatory Framework 5.5-15
  - 5.5.3 Impacts and Mitigation Measures 5.5-19
  - 5.5.4 References 5.5-32
- 5.6 Transportation and Circulation 5.6-1
  - 5.6.1 Setting 5.6-1
  - 5.6.2 Regulatory Framework 5.6-6
  - 5.6.3 Impacts and Mitigation Measures 5.6-7
  - 5.6.4 References 5.6-29
- 5.7 Noise and Vibration 5.7-1
  - 5.7.1 Setting 5.7-1
  - 5.7.2 Regulatory Framework 5.7-7
  - 5.7.3 Impacts and Mitigation Measures 5.7-9
  - 5.7.4 References 5.7-33
- 5.8 Air Quality 5.8-1
  - 5.8.1 Setting 5.8-1
  - 5.8.2 Regulatory Framework 5.8-6

Page

Volume 1 (continued)

5. Environmental Setting, Impacts, and Mitigation Measures (cont.)
5.8 Air Quality (cont.)
5.8.3 Impacts and Mitigation Measures 5.8-16
5.8.4 References 5.8-33

5.9 Wind and Shadow 5.9-1
5.9.1 Setting 5.9-1
5.9.2 Regulatory Framework 5.9-1
5.9.3 Impacts and Mitigation Measures 5.9-3
5.9.4 References 5.9-4

5.10 Recreation 5.10-1
5.10.1 Setting 5.10-1
5.10.2 Regulatory Framework 5.10-9
5.10.3 Impacts and Mitigation Measures 5.10-10
5.10.4 References 5.10-23

5.11 Utilities and Service Systems 5.11-1
5.11.1 Setting 5.11-1
5.11.2 Regulatory Framework 5.11-3
5.11.3 Impacts and Mitigation Measures 5.11-4
5.11.4 References 5.11-12

5.12 Public Services 5.12-1
5.12.1 Setting 5.12-1
5.12.2 Regulatory Framework 5.12-2
5.12.3 Impacts and Mitigation Measures 5.12-3
5.12.4 References 5.12-4

5.13 Biological Resources 5.13-1
5.13.1 Setting—Terrestrial and Wetlands Resources 5.13-1
5.13.2 Regulatory Framework 5.13-50
5.13.3 Impacts and Mitigation Measures—Terrestrial and Wetlands Resources 5.10-60
5.13.4 References—Terrestrial and Wetland Biology 5.13-117
5.13.5 Setting – Fisheries 5.13-125
5.13.6 Regulatory Framework – Fisheries 5.13-138
5.13.7 Impacts and Mitigation Measures – Fisheries 5.13-138
5.13.8 References--Fisheries 5.13-161

5.14 Geology and Soils 5.14-1
5.14.1 Setting 5.14-1
5.14.2 Regulatory Framework 5.14-10
5.14.3 Impacts and Mitigation Measures 5.14-13
5.14.4 References 5.14-21

5.15 Hydrology and Water Quality 5.15-1
5.15.1 Setting 5.15-1
5.15.2 Regulatory Framework 5.15-13
5.15.3 Impacts and Mitigation Measures 5.15-16
5.15.4 References 5.15-47

Page

Volume 1 (continued)

5. Environmental Setting, Impacts, and Mitigation Measures (cont.)

5.16 Hazards and Hazardous Materials 5.16-1
  5.16.1 Setting 5.16-1
  5.16.2 Regulatory Framework 5.16-4
  5.16.3 Impacts and Mitigation Measures 5.16-9
  5.16.4 References 5.16-22

5.17 Mineral and Energy Resources 5.17-1
  5.17.1 Setting 5.17-1
  5.17.2 Regulatory Framework 5.17-2
  5.17.3 Impacts and Mitigation Measures 5.17-4
  5.17.4 References 5.17-7

5.18 Agricultural Resources 5.18-1
  5.18.1 Setting 5.18-1
  5.18.2 Regulatory Framework 5.18-1
  5.18.3 Impacts and Mitigation Measures 5.18-2
  5.18.4 References 5.18-3

6. Mitigation Measures 6-1
6.1 Plans and Policies 6-1
6.2 Land Use 6-2
6.3 Aesthetics 6-2
6.4 Population and Housing 6-6
6.5 Cultural and Paleontological Resources 6-6
6.6 Transportation and Circulation 6-9
6.7 Noise and Vibration 6-12
6.8 Air Quality 6-13
6.9 Wind and Shadow 6-15
6.10 Recreation 6-15
6.11 Utilities and Service Systems 6-16
6.12 Public Services 6-16
6.13 Biological Resources 6-16
6.14 Geology and Soils 6-37
6.15 Hydrology and Water Quality 6-37
6.16 Hazards and Hazardous Materials 6-41
6.17 Mineral and Energy Resources 6-43
6.18 Agricultural Resources 6-43
6.19 Supplemental Mitigation Measures 6-43

7. Other CEQA Issues 7-1
7.1 Growth-Inducing Impacts 7-1
7.2 Summary of Cumulative Impacts 7-7
7.3 Significant Environmental Effects that Cannot be Avoided if the Proposed Project is Implemented 7-7
7.4 Significant Irreversible Environmental Changes 7-12
7.5 References 7-12

Page

Volume 1 (continued)

8. Alternatives **8-1**
- 8.1 Introduction 8-1
- 8.2 WSIP Alternatives 8-2
- 8.3 LCSDI Alternatives Analysis 8-4
- 8.4 Comparison of Alternatives 8-26
- 8.5 Alternatives Identification 8-31
- 8.6 Alternatives Considered but Rejected from Further Consideration 8-34
- 8.7 References 8-36

9. EIR Authors and Consultants **9-1**

Volume 2 (*bound separately*)

Appendices A through H

A. Notice of Preparation A-1
B. NOP Comments and Scoping Hearing Transcript B-1
C. LCSDI Project Operations Memo C-1
D. WSIP Water Supply Impacts and Mitigation Measures D-1
E. WSIP PEIR Mitigation Measures, Applicability to the Proposed Project E-1
F. Historic Context, Architectural and Archaeological Survey Report F-1
G. Supporting Documentation for Air Quality Analysis G-1
H. Wetland Determination Report H-1

Volume 3 (*bound separately*)

Appendices H through M

H. Wetland Determination Report (continued) H-253
I. Biological Resources Technical Report I-1
J. Supporting Documentation for Vegetation/Habitat Impacts J-1
K. Fish Habitat Surveys for LCSDI K-1
L. Blasting/Noise Impacts on Fish L-1
M. Supporting Documentation for Hydrology Analysis M-1

List of Figures

2-1 SFPUC Regional Water System 2-3
2-2 SFPUC Water Supply Watersheds 2-4
2-3 SFPUC Water Service Area – San Francisco and SFPUC Wholesale Customers 2-5
2-4 Peninsula Watershed Facilities 2-8
3-1 Project Location 3-3
3-2 Lower Crystal Springs Dam, Existing Conditions 3-9
3-3 Photograph of Upstream Face of Lower Crystal Springs Dam, Facing South 3-11
3-4 Photograph of Downstream Face of Lower Crystal Springs Dam, Facing South 3-12
3-5 Proposed Modifications to Lower Crystal Springs Dam, Plan View 3-14
3-6 Proposed Spillway Modifications, Cross-section 3-16

Page

List of Figures (continued)

3-7 Proposed Stilling Basin Modifications, Plan and Cross-section Views 3-17
3-8 Staging and Storage Areas in the Lower Crystal Springs Dam Vicinity 3-21
3-9a Staging and Storage Areas in LCSD Vicinity– Aerial Base 3-23
3-9b Staging and Storage Areas in LCSD Vicinity – Aerial Base 3-25
3-10 Staging and Storage Areas in Sampling Station #5 Vicinity 3-33
3-11 Staging and Storage Areas in Sampling Station #5 Vicinity – Aerial Base 3-35
3-12 Other Projects in the Immediate Vicinity of Lower Crystal Springs Dam 3-40
5.1-1 Cumulative Project Locations 5.1-7
5.1-2 Cumulative Projects with Overlapping Construction Schedules 5.1-10
5.1-3 Overlapping Construction Zones for Cumulative Projects in LCSD Vicinity 5.1-13
5.1-4 Cumulative Projects in Sampling Station #5 Vicinity 5.1-16
5.2-1 General Land Use in the Project Area 5.2-2
5.3-1 Photo Viewpoint Locations 5.3-3
5.3-2 Skyline Boulevard- Existing View and Visual Simulation 5.3-5
5.3-3 Crystal Springs Road- Existing View and Visual Simulation 5.3-6
5.3-4 Vista Point- Existing View and Visual Simulation 5.3-8
5.3-5 Sawyer Camp Trail- Existing View and Visual Simulation 5.3-10
5.3-6 Existing View from Fifield-Cahill Trail (Photo Viewpoint 5) 5.3-11
5.3-7 Example of a Dying Tree Reflected at the Shoreline of Crystal Springs Reservoir 5.3-26
5.3-8 Photo Viewpoint Locations of Shoreline Vegetation 5.3-28
5.3-9 Visual Effects of Inundation on Shoreline Woodlands from Sawyer Camp Trail 5.3-29
5.3-10 Visual Effects of Inundation on Shoreline Woodlands from Highway 92 and Cañada Road 5.3-30
5.3-11 Visual Effects of Inundation on Shoreline Vegetation from Skyline Boulevard 5.3-31
5.3-12 Vegetation Maps Showing Potential Areas of Inundation in Upper and Lower Crystal Springs Reservoirs 5.3-32
5.6-1 Key Roadways in the Project Area 5.6-2
5.6-2 Proposed Vehicle and Bicycle Detour 5.6-13
5.7-1 Noise Measurement Locations 5.7-4
5.10-1 Recreation Resources in the Project Area 5.10-4
5.13-1a Vegetation Communities 5.13-5
5.13-1b Vegetation Communities 5.13-6
5.13-1c Vegetation Communities 5.13-7
5.13-1d Vegetation Communities 5.13-8
5.13-2 Special-status Species Records for Peninsula Watershed South 5.13-13
5.13-3 Critical Habitat within the Project Area 5.13-53
5.13-4 Mitigation Sites 5.13-97
5.13-5 Upper San Mateo Creek Aquatic Habitat Survey Extent 5.13-128
5.13-6 Laguna Creek and Tributaries 5.13-130
5.13-7 Location of Pool #1 and Pool #2 at Base of Lower Crystal Springs Dam 5.13-134
5.13-8 Surveyed Salmonid Spawning Habitat in Lower San Mateo Creek Upstream of Polhemus 5.13-135
5.14-1 Site Geology 5.14-2
5.14-2 Major Regional Faults 5.14-7
5.15-1 Peninsula Watershed Facilities and Creeks 5.15-5
5.15-2 Crystal Springs Reservoir Historical Water Surface Elevations 5.15-8
5.15-3 Crystal Springs Reservoir - Monthly Average Water Surface Elevations 5.15-32
5.16-1 Fire Hazard Severity Map 5.16-5
5.13-4 Mitigation Sites 6-23

Page

List of Tables

1-1 Summary of LCSDI Impacts and Mitigation Measures 1-15
2-1 WSIP Goals and Objectives 2-6
2-2 Summary of Scoping Comments 2-11
3-1 Staging and Storage Areas 3-26
3-2 Construction Equipment Likely to be Used 3-27
5.1-1 Cumulative Projects and Impacts In or Near the Lower Crystal Springs Dam Improvements Project 5.1-18
5.2-1 Summary of Impacts – Land Use 5.2-6
5.3-1 Visibility and Visual Sensitivity of LCSDI Project Sites 5.3-12
5.3-2 Key Observation Point Locations 5.3-18
5.3-3 Summary of Impacts – Aesthetics 5.3-19
5.5-1 Historic Architectural Resources Evaluated in the C-APE 5.5-8
5.5-2 Historic Architectural Survey Results 5.5-11
5.5-3 Summary of Impacts – Cultural Resources 5.5-21
5.6-1 Daily Traffic Volumes on Regional Freeways 5.6-3
5.6-2 Daily and Peak-Hour Traffic Volumes on Local Roadways 5.6-4
5.6-3 Bicycle Volumes on Skyline Boulevard and Crystal Springs Road 5.6-5
5.6-4 LOS Criteria for Two-Lane Class II Highways 5.6-10
5.6-5 LOS Criteria for Unsignalized Intersections 5.6-10
5.6-6 Summary of Impacts – Transportation and Circulation 5.6-11
5.6-7 Daily Construction Vehicles and Hourly Construction Vehicle Trips at the LCSD Site 5.6-17
5.6-8 LOS Operating Conditions on Skyline Boulevard and Crystal Springs Road Weekday AM and PM Peak Hours 5.6-18
5.6-9 LOS Operating Conditions at Nearby Intersections Weekday AM and PM Peak Hours 5.6-19
5.7-1 Typical Sound Levels Measured in the Environment 5.7-2
5.7-2 Summary of Noise Measurement Results 5.7-5
5.7-3 San Mateo County Noise Limits 5.7-8
5.7-4 Summary of Impacts – Noise and Vibration 5.7-12
5.7-5 Noise Levels and Abatement Potential of Construction Equipment Noise at 50, 600, and 1,200 feet 5.7-14
5.7-6 Estimated Daytime Construction Noise Levels at the Closest Sensitive Receptors 5.7-15
5.7-7 Estimated Nighttime Construction Noise Levels at the Closest Sensitive Receptors to LCSD 5.7-20
5.8-1 San Francisco Bay Area Air Basin Ambient Air Quality Monitoring Summary – Redwood City (2005–2008) 5.8-2
5.8-2 State and Federal Ambient Air Quality Standards and Attainment Status 5.8-7
5.8-3 Summary of Impacts – Air Quality 5.8-19
5.8-4 Air Pollutant Emissions from Construction Activities at the LCSD Vicinity and Comparison to Proposed BAAQMD Significance Thresholds 5.8-21
5.8-5 Estimated Greenhouse Gas Emissions During Construction 5.8-25
5.8-6 Estimated Greenhouse Gas Emissions Due to Reduction in Biomass from Proposed Operations 5.8-28
5.10-1 Recreational Resources in the Project Area 5.10-2
5.10-2 Summary of Impacts – Recreation 5.10-12
5.11-1 Summary of Impacts – Utilities and Service Systems 5.11-6

List of Tables (continued)

Page

5.13-1 Special-status Plant Species with Potential to Occur in the Project Area 5.13-16
5.13-2 Special-status Wildlife Species with Potential to Occur in the Project Area 5.13-24
5.13-3 Summary of Impacts – Terrestrial and Wetlands Biological Resources 5.13-64
5.13-4 Summary of Predicted Changes in Extent of Vegetation Types Within the Inundation Zone Due to the Proposed Increase in Maximum Normal Operating Elevation from 283.8 to 287.8 Feet 5.13-79
5.13-5 Summary of Predicted Impacts on upland Vegetation Due to Occasional Exceedances of Reservoir Levels Above Elevation 287.8 Feet 5.13-82
5.13-6 Summary of Predicted Impacts on Special-Status Plants 5.13-86
5.13-7 Summary of Potential Mitigation Sites, Lower Crystal Springs Dam Improvement Project 5.13-93
5.13-8 Summary of Impacts – Fisheries 5.13-140
5.14-1 Summary of Impacts – Geology and Soils 5.14-15
5.15-1 Summary of Impacts – Hydrology and Water Quality 5.15-19
5.15-2 Scaling Factors Used to Adjust HH/LSM Data for Crystal Springs Reservoir Operations 5.15-30
5.15-3 Crystal Springs Reservoir – Percentage of Months that a Perimeter Contour is Inundated 5.15-33
5.16-1 Summary of Impacts – Hazards and Hazardous Materials 5.16-11
5.17-1 Summary of Impacts – Mineral and Energy Resources 5.17-5
5.13-7 Summary of Potential Mitigation Sites, Lower Crystal Springs Dam Improvement Project 6-19
7-1 Summary of Cumulative Impacts 7-8
8-1 Comparison of the Significant Environmental Impacts of the CEQA Alternatives 8-27

GLOSSARY AND ACRONYMS

Glossary

100-year flood – A flood that has a 1-percent chance of being equaled or exceeded in any given year.

A-weighted decibel (dBA) – Since the human ear is not equally sensitive to all sound frequencies within the entire spectrum, human response is factored into sound descriptions in a process called "A-weighting," expressed as "dBA." The dBA, or A-weighted decibel, refers to a scale of noise measurement that approximates the range of sensitivity of the human ear to sounds of different frequencies.

Alquist-Priolo Earthquake Fault Zone – The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. In accordance with this act, the state geologist established regulatory zones called "earthquake fault zones" around the surface traces of active faults and published maps showing these zones. Within these zones, buildings for human occupancy cannot be constructed across the surface trace of active faults. Each earthquake fault zone extends approximately 200 to 500 feet on either side of the mapped fault trace.

Alluvial fan – A fan-shaped deposit of sand, silt, or mud formed at the point where a stream emerges from a rivine into a plain or other relatively flat area.

Alluvium – Consists of unconsolidated mixtures of gravel, sand, clay, and silt typically deposited by streams.

Aquifer – Permeable subsurface materials (soil, sediments, and rock) that contain groundwater. Aquifers may be large or small, local or regional, shallow or deep, and confined or unconfined, depending on the subsurface geologic conditions. The permeable materials that surround an unconfined aquifer allow the water table to fluctuate in response to recharge (precipitation in the wet season) and discharge (evapotranspiration in the dry season). A confined aquifer is contained within impermeable materials and, as a result, the water table does not fluctuate.

Anadromous – Anadromous fish hatch (rear) in freshwater, migrate to the ocean (saltwater) to grow and mature, and migrate back to freshwater to spawn and reproduce.

Asbestos – A term used for several types of naturally occurring fibrous materials found in many parts of California, some of which have been found to be cancer-causing agents.

Beneficial use – Those uses of water as defined in the State of California Water Code (Chapter 10 of Part 2 of Division 2), including but not limited to agricultural, domestic, municipal, industrial, power generation, fish and wildlife habitat, recreation, and mining.

Biological monitoring – The periodic examination of biological specimens for the purposes of monitoring their exposure to or the effects of potentially toxic chemicals in the environment. Biological monitoring is typically performed by analyzing the amount of a toxic substance or its metabolites in body tissues and fluids. Also refers to assessing the biological status of populations and communities of organisms at risk in order to protect them and to gain an early warning of possible hazards to human health.

Biological Opinion – Document issued under the authority of the Federal Endangered Species Act stating the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service findings as to whether a federal action is likely to jeopardize the continued existence of a threatened or endangered species or result in the destruction or adverse modification of critical habitat.

California Environmental Quality Act (CEQA) – Regulations set forth in California Public Resources Code Sections 21000-21178 that requires state agencies to identify and minimize significant environmental effects of a project.

Channel – A natural or artificial watercourse, with a defined bed and banks to confine and convey continuously or periodically flowing water.

Chloramine/chloraminated – Chloramine is a chemical disinfecting agent comprised of a combination of chlorine and ammonia. Water that has been disinfected with chloramines is "chloraminated."

Chlorination – A disinfection process that involves the addition of free chlorine, whether as chlorine gas or liquid sodium hypochlorite.

Colluvium – A loose deposit of rock debris accumulated through the action of gravity at the base of a cliff or slope.

Community Noise Equivalent Level (CNEL) – Because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, state law requires that, for planning purposes, an artificial dBA increment be added to "quiet time" noise levels to form a 24-hour noise descriptor called the Community Noise Equivalent Level (CNEL). CNEL adds a 5-dBA "penalty" during the evening hours (7:00 p.m. to 10:00 p.m.) and a 10-dBA penalty during the night hours (10:00 p.m. to 7:00 a.m.).

Cultural resource – A fragile and nonrenewable remain of human activity that is valued by or significantly representative of a culture or that contains significant information about a culture.

Cultural resources encompass archaeological, traditional, and built environment resources, including landscapes or districts, sites, buildings, structures, objects, or cultural practices that are usually greater than 50 years of age and possess architectural, historic, scientific, or other technical value.

Cumulatively considerable – A CEQA term used to indicate whether or not a cumulative impact is significant.

Day-night noise level (Ldn) – Another 24-hour noise descriptor, called the day-night noise level (Ldn), is similar to CNEL. While both add a 10-dBA penalty to all nighttime noise events between 10:00 p.m. and 7:00 a.m., Ldn does not add the evening 5-dBA penalty. In practice, Ldn and CNEL usually differ by less than 1 dBA at any given location for transportation noise sources.

Deciduous trees – Trees that shed their leaves each year, typically in winter.

Discharge – The flow of surface water in a stream or canal or the outflow of groundwater from a flowing artesian well, ditch, or spring. Also refers to the discharge of liquid effluent from a facility, or to chemical emissions into the air through designated venting mechanisms.

Disinfection– Disinfection is the treatment process used to inactivate and destroy disease-causing bacteria, viruses, and other waterborne microorganisms. Chlorine, a commonly and historically used disinfectant in drinking water, provides a high degree of public health protection from bacteria and viruses.

Dissolved oxygen (DO) – The oxygen freely available in water, which is vital to fish and other aquatic life and for the prevention of odors. DO levels are considered an important indicator of a water body's ability to support desirable aquatic life. Secondary and advanced wastewater treatment are generally designed to ensure adequate DO in waste-receiving waters.

Disturbance – Any event or series of events that disrupt ecosystem, community, or population structure and alter the physical environment.

Diversion – The use of part of a stream flow as water supply; a channel for diverting water to sites where it can be used and disposed of.

Earthquake faults – A discrete surface or zone separating two rock masses (or blocks of crust) across which one mass has slid past the other.

Reverse faults involve predominantly vertical movement in which the upper block moves upward in relation to the lower block.

Thrust faults are low-angle reverse faults.

Ecosystem – A geographically identifiable area that encompasses unique physical and biological characteristics. It is the sum of the plant community, animal community, and environment in a particular region or habitat.

Endangered species – Any species or subspecies of bird, mammal, fish, amphibian, reptile, or plant that is in serious danger of becoming extinct throughout all or a significant portion of its range. Federally endangered species are officially designated by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service and published in the Federal Register. Species may also be listed under the California Endangered Species Act by the Department of Fish and Game.

Endemism – Species that are geographically restricted.

Engineered fill – A soil matrix that is nonhazardous, noncorrosive, free of organic matter (i.e., loam), well graded, and consisting of rocks or lumps less than 6 inches in greatest dimension. Engineered fill has a low expansion potential and is typically placed under controlled moisture and compaction conditions.

Enhancement – Measures that develop or improve the quality or quantity of existing conditions or resources beyond a condition or level that would have occurred without an action (i.e., beyond compensation).

Entrainment – The incidental trapping of fish and other aquatic organisms in the water (for example, at water and/or irrigation diversions and power plant cooling water intakes).

Environmental cases – Sites suspected of releasing hazardous substances or that have had cause for hazardous materials investigations and are identified on regulatory agency lists. These are sites where soil and/or groundwater contamination is known or suspected to have occurred.

Expansive soils – These types of soils are characterized by their ability to undergo significant volume change (shrink and swell) due to variations in soil moisture content.

Fault creep – Movement along a fault that does not entail earthquake activity.

Fish screen – Barrier on the front face of a river intake to prevent the entrainment of fish and debris into the water supply.

Floodplain – Land adjacent to a watercourse over which water flows in times of flood. The limits of the flood plain are defined by the peak level of a 1 in 100 year return period flood.

Flow – The volume of water passing a given point per unit of time.

Fluvial deposits – Sediments deposited in a stream channel, along a stream bank, or on a floodplain.

Fry – A stage of development in young salmon or trout. During this stage the fry is usually less than one year old, has absorbed its yolk sac, is rearing in the stream, and is between the alevin and parr stage of development.

Fugitive dust – "Fugitive" emissions generally refer to those emissions that are released to the atmosphere by some means other than through a stack or tailpipe.

Groundwater recharge – Inflow to aquifers from precipitation, infiltration, through-flow, and/or other means that replaces groundwater lost through pumping or other forms of discharge. The process of water being added to the saturated zone *or* the volume of water added by this process.

Habitat – The specific area or environment in which a particular type of animal or plant lives.

Hazardous materials – Defined in Section 25501(h) of the California Health and Safety Code, are materials that, because of their quantity, concentration, or physical or chemical characteristics, pose a substantial present or potential hazard to human health and safety or to the environment if released to the workplace or environment. Hazardous materials have been and are commonly used in commercial, agricultural, and industrial applications as well as in residential areas to a limited extent.

Hazardous materials business plans – Businesses that handle specified quantities of chemicals are required to submit a hazardous materials business plan (HMBP) in accordance with community right-to-know laws. This plan allows local agencies to plan appropriately for a chemical release, fire, or other incident.

Hazardous waste – Any material that is relinquished, recycled, or inherently waste-like. Title 22 of the California Code of Regulations, Division 4.5, Chapter 11 contains regulations for the classification of hazardous wastes. A waste is considered a hazardous waste if it is toxic (causes human health effects), ignitable (has the ability to burn), corrosive (causes severe burns or damage to materials), or reactive (causes explosions or generates toxic gases) in accordance with the criteria established in Article 3. Article 4 lists specific hazardous wastes, and Article 5 identifies specific waste categories, including Resource Conservation and Recovery Act (RCRA) hazardous wastes, non-RCRA hazardous wastes, extremely hazardous wastes, and special wastes.

Heritage trees – Large, old, or historically important trees that receive protection on a local basis.

Hydrology – The science that deals with the waters above and below land surfaces; their occurrence, circulation, and distribution, both in time and space; their biological, chemical, and physical properties; and their reaction with their environment, including their relation to living beings.

Juvenile – A young or sexually immature animal.

Lateral spreading – A phenomenon where large blocks of intact, nonliquefied soil move downslope on a liquefied substrate of large aerial extent.

Leq – Time variations in noise exposure are typically expressed in terms of a steady-state energy level (called Leq) that represents the acoustical energy of a given measurement. Leq (24) is the steady-state energy level measured over a 24-hour period.

Levee – An embankment raised to prevent a river from overflowing.

Liquefaction – A phenomenon in which saturated granular sediments temporarily lose their shear strength during periods of earthquake-induced, strong groundshaking. The susceptibility of a site to liquefaction is a function of the depth, density, and water content of the granular sediments and the magnitude of earthquakes likely to affect the site.

Level of service – A qualitative description of a transportation facility's performance based on average delay per vehicle, vehicle density, or volume-to-capacity ratios. Levels of service range from LOS A, which indicates free-flow or excellent conditions with short delays, to LOS F, which indicates congested or overloaded conditions with extremely long delays.

Mitigation – One or all of the following: (1) Avoiding an impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of an action and its implementation; (3) rectifying an impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating an impact over time by preservation and maintenance operations during the life of an action; and (5) compensating for an impact by replacing or providing substitute resources or environments.

Parapet wall – A solid wall built along the top of a dam for ornament, for the safety of vehicles and pedestrians, or to prevent overtopping.

Peak particle velocity (PPV) – To assess the potential for structural damage associated with vibration, the vibratory ground motion in the vicinity of the affected structure is measured in terms of peak particle velocity (PPV) in the vertical and horizontal directions (vector sum), typically in units of inches per second (in/sec).

Permitted hazardous materials uses – Facilities that use hazardous materials or handle hazardous wastes but comply with current hazardous materials and hazardous waste regulations.

Propagation – To move or transmit something forward in space, especially as a light or sound wave.

Predation – The act of preying on another animal or animals.

Program Environmental Impact Report – One type of environmental review document identified under the California Environmental Quality Act that may be used to evaluate a plan or program that has multiple components (projects and actions) or to address a series of actions that are related.

Rearing – The amount of time that juvenile fish spend feeding in nursery areas of rivers, lakes, streams, and estuaries before migration, or the care and support for young fish.

Rearing habitat – Areas where larval and juvenile fish find food and shelter.

Regional water system – The entire SFPUC water system starting at Hetch Hetchy Reservoir and ending in San Francisco; the regional system includes all facilities serving the SFPUC wholesale and retail customers, except for the retail customers in San Francisco. The SFPUC regional water system consists of a complex network of facilities covering a geographic range of about 160 miles, from the Sierra Nevada on the east to San Francisco on the west. The regional water system crosses seven counties—Tuolumne, Stanislaus, San Joaquin, Alameda, Santa Clara, San Mateo, and San Francisco. The regional water system includes over 280 miles of pipelines, over 60 miles of tunnels, 11 reservoirs, 5 pump stations, and 2 water treatment plants.

Riffles – A stretch of choppy water caused by stones or other objects in a river or stream.

Riparian – The land adjacent to a natural watercourse such as a river or stream. Riparian areas support vegetation that provides important wildlife habitat, as well as important fish habitat when sufficient to overhang the bank.

Salmonid – Salmon or trout.

Sedimentation – The deposition of material suspended in a stream system, whether in suspension (suspended load) or on the bottom (bedload).

Seiche – Earthquake-induced oscillating waves in an enclosed water body.

Sensitive receptors – A land use that is sensitive or more vulnerable to (i.e., "receives") effects of noise, air quality, or a specified resource than the general population.

Siltation – Sediment influx from either erosion or from sediment carried into a water body by inflowing rivers and tributaries.

Smolts – Juvenile fish that have undergone the physiological changes necessary for them to migrate from freshwater streams to the ocean.

Spawning – Laying (and fertilizing) eggs in the process of reproduction.

Special-status species – Several species known to occur within the general region of the program area are accorded "special status" because of their recognized rarity or vulnerability to habitat loss or population decline. Some of these species receive specific protection in federal and/or state endangered species legislation. Others have been designated as "sensitive species" or "species of special concern" on the basis of adopted policies of federal, state, or local resource agencies. These species are referred to collectively as "special-status species."

Spillway – A structure used to provide for the controlled release of flows from a dam into a downstream area, typically being the river that was dammed.

Spill sites – Locations where a spill of hazardous materials has been reported to the state or federal regulatory agencies.

Stilling basin – A basin constructed so as to dissipate the energy of fast-flowing water, e.g., from a spillway or bottom outlet, and to protect the river bed from erosion.

Stoplogs – Large logs or timbers or steel beams placed on top of each other with their ends held in guides on each side of a channel or conduit so as to provide a cheaper or more easily handled means of temporary closure than a bulkhead gate.

Subsidence – The lowering of the land surface in response to groundwater pumping.

Substrate – The materials found in streambeds or riverbeds (i.e., large and small boulders, stone, rubble, cobble, pebble, coarse and fine gravel, sand, silt, and clay). The surface upon which an organism grows or is attached.

Surface water – All water that is naturally open to the atmosphere (i.e., rivers, lakes, reservoirs, ponds, streams, impoundments, seas, estuaries, etc.).

Suspended particulates (PM10 and PM2.5) – Particulate matter is a class of air pollutants that consists of solid and liquid airborne particles in an extremely small size range. Particulate matter is measured in two size ranges: PM10 for particles less than 10 microns in diameter, and PM2.5 for particles less than 2.5 microns in diameter.

Swales – Areas where winter rain collects but does not stand as long as in vernal pools.

Terrestrial species – Types of species of animals and plants that live on or grow from the land.

Threatened species – Legal status afforded to plant or animal species that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range, as determined by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service.

Threshold damage vibration – The highest vibration amplitude at which no cosmetic, minor, or major damage occurs, which includes "threshold cracks" or "hair-sized" cracks in room walls that occur at the lowest vibration amplitudes.

Toe of dam – The junction of the downstream face of a dam with the ground surface.

Top of dam – The elevation of the uppermost surface of a dam, usually a road or walkway, excluding any parapet wall, railings; etc.

Training wall – A wall built to confine or guide the flow of water.

Ultramafic rocks – Rocks that are formed in high-temperature environment environments well below the surface of the earth.

Vernal pools – Seasonal wetlands formed in gently undulating or rolling topography where the soil is underlain by a slowly permeable claypan or hardpan.

Water rights – In California, the legal right to the use of water.

Waters of the United States – A broad federal definition that describes U.S. Army Corps of Engineers jurisdiction over deep-water habitats and special aquatic sites, including wetlands, as follows:

> The territorial seas with respect to the discharge of fill material.
>
> Coastal and inland waters, lakes, rivers, and streams that are navigable waters of the United States, including their adjacent wetlands.
>
> Tributaries to navigable waters of the United States, including wetlands.
>
> Interstate waters and their tributaries, including adjacent wetlands.

All other waters of the United States not identified above, such as isolated wetlands and lakes, intermittent streams, prairie potholes, and other waters that are not a part of a tributary system to interstate waters or navigable waters of the United States, the degradation or destruction of which could affect interstate commerce.

Watershed – A region or area bounded peripherally by a water parting and draining ultimately to a particular watercourse or body of water.

Watershed management – The net result of numerous and varied actions in a watershed that directly affect watershed function and productivity. Actions may include, but are not limited to, land use decision-making, restoration and enhancement projects, monitoring and assessment of watershed condition, natural resource allocation and use, parcel management techniques, and education programs. Watershed management includes protection of existing healthy conditions.

Wetland – A zone periodically or continuously submerged or having high soil moisture, which has aquatic and/or riparian vegetation components, and is maintained by water supplies significantly in excess of those otherwise available through local precipitation.

Acronyms and Abbreviations

°C	degrees Celsius
°F	degrees Fahrenheit
AASHTO	American Association of State Highway and Transportation Officials
AB	Assembly Bill
ABAG	Association of Bay Area Governments
ACOE	U.S. Army Corps of Engineers
ADRR	Archeological Data Recovery Report
AEER	Archeological Evaluation and Effects Report
AEP	Archeological Evaluation Plan
APE	Area of Potential Effects
APS	Auxiliary Power System
ARDTP	Archeological Research Design and Treatment Plan
ASCE	American Society of Civil Engineers
ATCM	Airborne Toxic Control Measure
BAAQMD	Bay Area Air Quality Management District
BART	Bay Area Rapid Transit
BMPs	best management practices
C-APE	CEQA Area of Potential Effects
C/CAG	City/County Association of Governments
Cal-EPA	California Environmental Protection Agency
Cal-OSHA	California Occupational Safety and Health Administration
Caltrans	California Department of Transportation
CAL FIRE	California Department of Forestry
Cal Water	California Water Service Company
CAP	Clean Air Plan
CARB	California Air Resources Board
CBC	California Building Code
CCR	California Code of Regulations
CCTS	Central California Taxonomic System
CCSF	City and County of San Francisco
CDFG	California Department of Fish and Game
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CGS	California Geological Survey
CH_4	methane
CHP	California Highway Patrol
CIWMA	California Integrated Waste Management Act
CMP	Congestion Management Program
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
Corps	U.S. Army Corps of Engineers
CO	carbon monoxide

CO_2	carbon dioxide
CO_2-E	CO_2-equivalent
CPUC	California Public Utilities Commission
CRHR	California Register of Historical Resources
CRLF	California red-legged frog
CSCSD	Crystal Springs County Sanitation District
CSPL2	Crystal Springs Pipeline No. 2
CSSA	Crystal Springs / San Andreas Transmission Line Upgrade
CUPA	Certified Unified Program Agency
CWA	Clean Water Act
CWHR	California Wildlife Habitat Relationships
dB	decibel
dBA	A-weighted decibel
DBH	diameter at breast height
DEHP	di (2 ethylhexyl) phthalate
DFIRM	digital flood insurance rate map
DPM	diesel particulate matter
DPS	Distinct Population Segment
DSOD	(California) Division of Safety of Dams
DTSC	California Department of Toxic Substances Control
EIR	environmental impact report
EMS	San Mateo County Emergency Medical Services
ERO	Environmental Review Officer
ERT	Emergency Response Team
Fed-OSHA	Federal Occupational Safety and Health Administration
FEMA	Federal Emergency Management Agency
FESA	Federal Endangered Species Act
FHWA	Federal Highway Administration
FIRMs	Flood Insurance Rate Maps
FTA	Federal Transit Administration
g	acceleration due to gravity
GHG	greenhouse gas
GGNRA	Golden Gate National Recreation Area
GIS	geographic information system
GWP	global warming potential
H_2O	water
HAER	Historic American Engineering Record
HCP	habitat conservation plan
HEPA	high-efficiency particulate air
HH/LSM	Hetch Hetchy/Local Simulation Model
HRP	Habitat Reserve Program
I-280	Interstate 280
IBC	International Building Code
kWh	kilowatt-hours
LCSD	Lower Crystal Springs Dam

LCSDI	Lower Crystal Springs Dam Improvements project
Ldn	day-night noise level
LEED	Leadership in Energy and Environmental Design
Leq	steady-state energy level
Lmax	worst-case noise level
LOS	level of service
LUST	leaking underground storage tank
μg/L	micrograms per liter
μg/m^3	micrograms per cubic meter
μS/cm	microsiemen per centimeter
M	moment magnitude
MBTA	Migratory Bird Treaty Act
MBTRA	Migratory Bird Treaty Reform Act
MCL	maximum contaminant level
MEA	San Francisco Planning Department, Major Environmental Analysis Division
MLD	Most Likely Descendant
mg/kg	milligrams per kilogram
mgd	million gallons per day
MMTCO$_2$E	million gross metric tons of carbon-dioxide-equivalent
mph	miles per hour
MTBE	methyl tertiary-butyl ether
MTC	Metropolitan Transportation Commission
Muni	San Francisco Municipal Railway
N_2O	nitrous oxide
NAAQS	national ambient air quality standards
NAHC	California Native American Heritage Commission
NCSBT	New Crystal Springs Bypass Tunnel
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOx	nitrogen oxides
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRA	National Recovery Act
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
NWIC	Northwest Information Center
NWP	nationwide permit
O_3	ozone
OAP	Ozone Attainment Plan
OEM	Office of Emergency Management
OHP	Office of Historic Preservation
OSHA	Occupational Safety and Health Administration
OU	operable unit
PAHs	polynuclear aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PEIR	Program Environmental Impact Report

Peninsula WMP	Peninsula Watershed Management Plan
PG&E	Pacific Gas and Electric Company
PMF	Probable Maximum Flood
PM_{10}	particulate matter, 10 microns or less in diameter
$PM_{2.5}$	particulate matter, 2.5 microns or less in diameter
ppb	parts per billion
ppm	parts per million
PPV	peak particle velocity
PRC	California Public Resources Code
PWA	Public Works Administration
REB	Resource Efficient Building
RMS	root mean square
ROG	reactive organic gases
ROW	right-of-way
RWQCB	(California) Regional Water Quality Control Board
SAAQS	state ambient air quality standards
SamTrans	San Mateo County Transit District
SB	Senate Bill
SCP	scientific collections permit
SDC	Seismic Design Category
SF Bay RWQCB	San Francisco Bay Regional Water Quality Control Board
SFDE	San Francisco Department of the Environment
SFGS	San Francisco garter snake
SFO	San Francisco International Airport
SFPUC	San Francisco Public Utilities Commission
SFWD	San Francisco Water Department
SIP	State Implementation Plan
SO_2	sulfur dioxide
SOD	Sudden Oak Death
SOPs	Standard Operating Procedures
SVOC	semi-volatile organic compounds
SVP	Society of Vertebrate Paleontology
SWPPP	storm water pollution prevention plan
SWRCB	State Water Resources Control Board
TMDLs	total maximum daily loads
TPZ	Tree Protection Zone
UCMP	University of California Museum of Paleontology
UCSD	Upper Crystal Springs Dam
UNESCO	United Nations Educational, Scientific, and Cultural Organization
US EPA	U.S. Environmental Protection Agency
US 101	U.S. 101 Freeway
USA	Underground Services Alert
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
v/c	volume-to-capacity ratio
VOC	volatile organic compound

WDR	waste discharge requirements
WMP	Watershed Management Plan
WSIP	Water System Improvement Program
ZEV	zero-emission vehicle

CHAPTER 1

Executive Summary

Sections

1.1 Introduction and Purpose of the Project
1.2 Overview of the SFPUC Regional Water System
1.3 Project Background and Objectives
1.4 Project Description
1.5 Summary of Project Environmental Impacts and Mitigation Measures
1.6 Alternatives to the Proposed Project
1.7 Significant and Unavoidable, and Potentially Significant and Unavoidable Impacts of the Proposed Project
1.8 Areas of Controversy

Tables

1-1 Summary of LCSDI Impacts and Mitigation Measures

1.1 Introduction and Purpose of the Project

The San Francisco Public Utilities Commission (SFPUC) is proposing to implement the Lower Crystal Springs Dam Improvements project (LCSDI, proposed project, or project). This project would modify various features of the Lower Crystal Springs Dam (LCSD) to comply with requirements of the California Department of Water Resources, Division of Safety of Dams (DSOD). Implementation of the project would result in the removal of the DSOD operating restrictions on Crystal Springs Reservoir and restoration of the historical storage capacity of the reservoir. The project also includes raising an existing water quality sampling station (Sampling Station #5) at its current location to accommodate the proposed changes in reservoir operations. All project components are located in an unincorporated area of San Mateo County on lands owned by the City and County of San Francisco (CCSF). The proposed project would improve the SFPUC's ability to deliver water to its customers, particularly during dry years.

Under the San Francisco Administrative Code, Chapter 31, the San Francisco Planning Department, Major Environmental Analysis Division (MEA) is responsible for implementing the environmental review of CCSF projects pursuant to the requirements of the California Environmental Quality Act (CEQA). MEA is the lead agency responsible for preparing this environmental impact report (EIR) in compliance with CEQA, and the SFPUC is the project sponsor proposing to implement the LCSDI project. This document constitutes the EIR on the proposed project and serves as a public informational document for use by government agencies and the public for disclosure of the potential physical environmental impacts of the project and for identification of feasible mitigation measures and alternatives to the project.

1.2 Overview of the SFPUC Regional Water System

The LCSD and Crystal Springs Reservoir are major facilities in the SFPUC regional water system, and this overview provides background information about the water system as context for the proposed project. It includes a description of the existing regional water system and the SFPUC's ongoing Water System Improvement Program (WSIP).

1.2.1 Existing Regional Water System

The CCSF, through the SFPUC, owns and operates a regional water system that serves drinking water to 2.4 million people in the San Francisco Bay area. The SFPUC currently delivers an annual average of about 265 million gallons per day (mgd) of water to its customers. The source of the water supply is a combination of water imported from the Tuolumne River watershed and local supplies from streamflow and runoff in the Alameda Creek watershed and in the San Mateo and Pilarcitos Creeks watersheds (referred to together as the Peninsula watersheds). Local watersheds provide about 15 percent of total supplies and the Tuolumne River provides the remaining 85 percent. The regional water system—including 280 miles of pipelines, over 60 miles of tunnels, 11 reservoirs, 5 pump stations, and 2 water treatment plants—extends about 170 miles from the Sierra Nevada to San Francisco and spans seven counties (Tuolumne, Stanislaus, San Joaquin, Alameda, Santa Clara, San Mateo, and San Francisco Counties). The proposed project is located near the western terminus of the regional system in the CCSF-owned Peninsula watershed, which includes large portions of the natural drainage areas of San Mateo, Laguna, Pilarcitos, and San Andreas Creeks. The LCSD impounds both Upper and Lower Crystal Springs Reservoirs, which are managed as a single reservoir and together comprise Crystal Springs Reservoir, the largest storage facility in the regional water system west of San Francisco Bay serving customers in San Mateo and San Francisco Counties.

The SFPUC serves about one-third of its water supplies directly to retail customers, primarily in San Francisco, and about two-thirds of its water supplies to wholesale customers, primarily along the Peninsula and South Bay, by contractual agreement. The wholesale customers are largely represented by the Bay Area Water Supply and Conservation Agency, which consists of 27 member customers in Alameda, San Mateo, and Santa Clara Counties.[1] Some of these wholesale customers have other sources of water in addition to what they receive from the SFPUC regional system, while others rely completely on the SFPUC for their supply.

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[1] The Cordilleras Mutual Water Association is also a wholesale customer receiving water from the SFPUC, but it is not a BAWSCA member. It is a small water association serving 18 single-family homes located in San Mateo County.

1.2.2 SFPUC Water System Improvement Program

On October 30, 2008, the SFPUC adopted a systemwide program, the WSIP (also known as the "Phased WSIP Variant"), which includes overall goals and system performance objectives (SFPUC Resolution 08-200). The WSIP is a comprehensive program designed to improve the regional system with respect to water quality, seismic response, and water delivery based on a planning horizon through the year 2030 and to improve the regional system with respect to water supply to meet water delivery needs in the service area through the year 2018. The WSIP consists of a water supply strategy and modifications to system operations as well as construction of a series of facility infrastructure improvement projects located in seven counties—Tuolumne, Stanislaus, San Joaquin, Alameda, Santa Clara, San Mateo, and San Francisco. The proposed project is one of the WSIP facility improvement projects.

The overall goals of the WSIP are to maintain high-quality water; reduce vulnerability to earthquakes; increase delivery reliability and improve the ability to maintain the system; meet customer water supply needs; enhance sustainability in all system activities; and achieve a cost-effective, fully operational system (see Table 2-1 in Chapter 2, Section 2.2.2). To further these program goals, the WSIP also includes system performance objectives in the areas of water quality, seismic reliability, delivery reliability, and water supply (see SFPUC Resolution 08-0200).

To address the potential environmental impacts of the WSIP in compliance with CEQA, the San Francisco Planning Department prepared a Program EIR (PEIR) on the proposed WSIP, which the San Francisco Planning Commission certified on October 30, 2008 (San Francisco Planning Department, 2008; San Francisco Planning Commission Motion No. 17734). The PEIR evaluated the environmental impacts of the WSIP water supply strategy and system operations at a project level of detail, and it evaluated the environmental impacts of the WSIP facility improvement projects at a program level of detail. When the SFPUC approved the WSIP, it made CEQA Findings on the WSIP, including a statement of overriding considerations and adoption of a mitigation monitoring and reporting program for the WSIP (SFPUC Resolution 08-200) (SFPUC, 2008).

This document is the EIR on the LCSDI project. It is a project-level EIR that tiers from the WSIP PEIR and also incorporates by reference the relevant analyses presented in the PEIR with respect to the WSIP's impacts and mitigation measures, as applicable to this project. The PEIR (State Clearinghouse No. 2005092026) is available for public review at the San Francisco Planning Department, 1650 Mission Street, San Francisco, CA 94103, and is on the Planning Department's website at http://mea.sfplanning.org. CEQA permits tiering from a program EIR in order to allow agencies to broadly consider the environmental effects of a series of related actions and/or policies, and then to provide more detailed examination of project-specific impacts in subsequent project-level EIRs. This project was defined as part of the WSIP in the PEIR and was analyzed in the PEIR at a programmatic level as one of the WSIP facility improvement projects. This project-level EIR specific to the LCSDI provides more detailed information about the proposed project, its impacts and project-specific mitigation measures, and alternatives to the proposed project. This EIR summarizes and incorporates by reference the PEIR analysis of the impacts associated with the WSIP's water supply strategy and system operations, including the PEIR analysis and conclusions regarding impacts on the SFPUC's watersheds and the WSIP's growth-inducement impacts. The analysis of water supply and growth-inducement impacts in the PEIR included full consideration of the proposed project in the context of the regional system and was in sufficient detail that no further analysis of these aspects of the proposed project is required.

The following sections summarize the WSIP and the water supply and system operations strategy, as well as the WSIP's water supply impacts and mitigation measures as identified in the PEIR.

1.2.2.1 WSIP Program Description

The WSIP entails improvements to the regional system with respect to water quality, seismic response, and water delivery based on a planning horizon through the year 2030. The WSIP also includes phased implementation of a water supply strategy to meet projected water demand through 2018. The WSIP also includes full implementation of proposed WSIP facility improvement projects to insure that the public health, seismic safety, and delivery reliability goals are achieved as soon as possible.[2] Under the WSIP, the SFPUC established the year 2018 as an interim mid-term planning horizon for its water supply strategy. Thus, the SFPUC made a decision about a water supply strategy to serve its customers through 2018, and it is deferring a decision regarding long-term water supply after 2018 and through 2030 until it undertakes further water supply planning and demand analysis.

The WSIP water supply strategy includes the following key program elements:

- Full implementation of all 17 proposed WSIP facility improvement projects described in the PEIR
- Water supply delivery of 265 mgd (average annual target delivery) to regional water system customers through 2018, with waters originating from the Tuolumne, Alameda Creek, and Peninsula watersheds, which includes 184 mgd for the wholesale customers (including 9 mgd for the cities of San Jose and Santa Clara) and 81 mgd for the retail customers
- Development of 20 mgd of conservation, recycled water, and groundwater projects within the SFPUC service area (10 mgd in the retail service area and 10 mgd in the wholesale service area)
- Dry-year transfer from the Modesto and/or Turlock Irrigation Districts of about 2 mgd coupled with the Westside Groundwater Basin conjunctive-use project to meet the drought-year goal of limiting rationing to no more than 20 percent on a systemwide basis

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[2] The size and design of the WSIP facility improvement projects were driven by the SFPUC's system performance objectives and would not change as a result of the water supply decision included as part of the WSIP (see SFPUC Resolution No. 08-0200).

- Reevaluation of 2030 demand projections, potential regional water system purchase requests, and water supply options by 2018, and a separate SFPUC decision in 2018 regarding regional water system water deliveries after 2018
- Financial incentives to limit water sales to an annual average of 265 mgd from the watersheds

Under the WSIP, the SFPUC will deliver to its customers up to 265 mgd from the SFPUC watersheds on an average annual basis. Average annual deliveries from the SFPUC watersheds would be limited to 265 mgd (i.e., there would be no increase in diversions from the Tuolumne River to serve additional demand); however, there would be a small increase in average annual Tuolumne River diversions of about 2 mgd over existing conditions in order to meet delivery and drought reliability goals through 2018.

The SFPUC must maintain water deliveries to all its customers for the protection of public health and safety. Therefore, under the WSIP, the SFPUC will work with its customers to develop financial incentives to limit water sales to an average annual amount of 265 mgd from the watersheds through 2018. With the projected 20 mgd of conservation, recycled water, and groundwater projects, the WSIP water supply strategy would meet the projected average daily demand of 285 mgd in 2018.

As part of the adoption of the WSIP, the SFPUC has committed to implementing the mitigation measures identified in the PEIR, including measures addressing impacts that could result from increases in deliveries from the SFPUC watersheds over the total average annual of 265 mgd in the event that conservation, recycled water, and groundwater projects are not completed prior to an increase in customer demand (SFPUC Resolution No. 08-0200).

1.2.2.2 WSIP Systemwide Operation Strategy

The WSIP also provides a future operating strategy for the regional water system that addresses the condition of the physical facilities and infrastructure while accounting for factors that affect the system, including fluctuating customer demand, meteorological and hydrological conditions, facility and infrastructure capacity and maintenance requirements, and institutional parameters. The operating strategy addresses four components of system operation: water supply and storage, water quality, water delivery, and asset management.

Day-to-day water system operations under the WSIP will be similar to existing operations, but will provide for improved facility maintenance activities and emergency preparedness. The facility improvements will allow the SFPUC to meet the WSIP objectives and will provide for increased system reliability and additional flexibility for scheduling repairs and maintenance. The proposed operations strategy also incorporates a multistage drought response program. Under the WSIP, regional water system operations will continue to meet all applicable institutional and planning requirements, including complying with water quality, environmental, and public safety regulations; maximizing the use of water from local watersheds; assigning a higher priority to water delivery over hydropower generation; and meeting downstream flow requirements.

1.2.2.3 Summary of Impacts and Mitigation Measures associated with the WSIP Water Supply and System Operations Strategy

The PEIR analyzed potential water supply and system operations impacts within the following geographic regions: the Tuolumne River watershed, Alameda Creek watershed, Peninsula watershed, and Westside Groundwater Basin. The PEIR also identified the cumulative effects of implementing the WSIP and system operations in combination with other past, present, and reasonably foreseeable future projects within each of these watersheds and discussed the potential effects of climate change and global warming on the regional water system. These analyses in the PEIR are hereby incorporated by reference into this EIR and are summarized in the appropriate section of this EIR.

The WSIP will result in changes in reservoir levels and associated changes in downstream flows in rivers and creeks in the three affected watersheds, potentially affecting groundwater, water quality, fisheries, and terrestrial biological resources. In the event that water deliveries to customers exceeded 265 mgd (average annual), streamflow changes in the Tuolumne River watershed could affect fisheries and terrestrial biological resources. In the Alameda Creek and Peninsula watersheds, the WSIP, which includes restoring the historical storage capacities of Calaveras and Crystal Springs Reservoirs, could affect reservoir levels, downstream flows, fisheries and terrestrial biological resources. In addition, the WSIP will develop groundwater supplies in the North Westside Groundwater Basin as well as a conjunctive-use program in the South Westside Groundwater Basin.

The WSIP impacts identified in the PEIR that are potentially significant but mitigable, potentially significant and unavoidable, and significant and unavoidable are listed below. As indicated in the PEIR, the San Francisco Planning Department determined that the environmental impacts on all resources not listed below would be less than significant, and no mitigation measures for these impacts would be required. (See WSIP PEIR Chapter 5, Environmental Setting and Impacts, for further discussion of the impact analysis on the WSIP's water supply strategy; see PEIR Chapter 6 for a description of the mitigation measures associated with these impacts.)

Potentially Significant but Mitigable WSIP Water Supply and System Operations Impacts

- Fishery Resources: Tuolumne River (only when average annual deliveries from the watersheds exceed 265 mgd); Alameda Creek.

- Terrestrial Biological Resources: Tuolumne River (below La Grange Dam – only when average annual deliveries exceed 265 mgd; and impacts on alluvial features that support meadow and riparian habitat from O'Shaughnessy Dam to Don Pedro Reservoir); Calaveras Reservoir; Alameda Creek; Calaveras Creek; Upper and Lower Crystal Springs Reservoir.

- Groundwater: Pumping overdraft; change in water levels in Lake Merced and other surface water features; seawater intrusion due to decreased groundwater levels; contamination of drinking water.

Potentially Significant and Unavoidable WSIP Water Supply and System Operations Impacts

- Fisheries: Upper and Lower Crystal Springs Reservoir. Based on the best available information at that time, the PEIR made the conservative determination that the WSIP would result in potentially significant and unavoidable impact on fishery resources in Crystal Springs Reservoir related to inundation of spawning habitat upstream of the reservoir (see PEIR Chapter 5, Section 5.5.5, Impact 5.5.5-1). The project-level fisheries analysis in this EIR modifies certain PEIR impact determinations based upon more detailed site-specific data and analysis. Project-level conclusions supersede any contrary impact conclusions in the PEIR. Project-level review of updated, site-specific information that was developed following certification of the PEIR has been incorporated into this EIR, and the project-level analysis has determined that impacts on fishery resources due to inundation effects would be less than significant (see Chapter 5.13, Impact BI-15).

- Growth inducement: SFPUC service area.

Significant and Unavoidable WSIP Water Supply and System Operations Impacts

- Streamflow: Alameda Creek below the Alameda Creek Diversion Dam. Based on the best available information at that time, the PEIR made the conservative determination that the WSIP would result in a significant and unavoidable impact related to flow along Alameda Creek below the Alameda Creek Diversion Dam ("Alameda Creek Hydrologic Impact") (see PEIR Chapter 5, Section 5.4.1, Impact 5.4.1-2). The project-level analysis conducted for the Draft EIR on the Calaveras Dam Replacement Project, published in October 2009 (San Francisco Planning Department, 2009), determined this impact to be less than significant based upon more detailed site-specific data (see Calaveras Dam Replacement Project Draft EIR Chapter 4, Section 4.6, Impact 4.6.5). To be conservative, this EIR assumes the PEIR's significant and unavoidable impact determination for the PEIR's Alameda Creek Hydrologic Impact (PEIR Impact 5.4.1-2). The lead agency, however, will update this EIR to be consistent with the Calaveras Dam Replacement Project Final EIR if the Calaveras document is certified prior to finalizing this EIR. Certification of the Calaveras Dam Replacement Project EIR is scheduled for July 2010.

1.2.2.4 Alternatives to the WSIP

The PEIR evaluated seven alternatives to the WSIP because of their apparent ability to meet most of the WSIP's goals, their ability to reduce one or more of the significant impacts associated with program implementation, their potential feasibility, and their collective ability to provide a reasonable range of alternatives to foster informed decision-making and public participation. Analysis of the No Program Alternative was included as required by CEQA. The seven WSIP alternatives are summarized in Chapter 8, Alternatives, of this EIR; PEIR Chapters 9 and 14 present a more detailed summary of these alternatives and are incorporated into this EIR by reference.

1.3 Project Background and Objectives

1.3.1 Project Background

The LCSDI project is one of the key regional facility improvement projects under the WSIP. The LCSDI would support the WSIP goals and system performance objectives related to seismic reliability, delivery reliability, and water supply reliability for the overall regional water system.

The LCSD was built in 1890 on San Mateo Creek downstream of its confluences with San Andreas and Laguna Creeks and forms Lower Crystal Springs Reservoir. Since 1924, Upper and Lower Crystal Springs Reservoirs have been hydraulically connected and operated as a single reservoir, referred to Crystal Springs Reservoir. The LCSD is regulated by the DSOD. In 1983, the DSOD restricted the amount of water the SFPUC could store in Crystal Springs Reservoir because of concerns that the dam could be overtopped and subsequently be damaged and/or even fail during the Probable Maximum Flood (PMF). The PMF is the theoretical flood event predicted to occur under the most severe and extreme combination of meteorological and hydrological conditions in a particular drainage area. The DSOD requires that the SFPUC limit the maximum normal water surface elevation in Crystal Springs Reservoir to 283.8 feet NGVD.[3] Prior to 1983, the SFPUC was allowed to operate the reservoir to allow water levels to a maximum elevation of 291.8 feet with the installation of stoplogs in the spillway, which enabled the SFPUC to maximize storage in Crystal Springs Reservoir. In order to lift these DSOD restrictions, the SFPUC must take one of three actions:

- Demonstrate that the dam as it currently exists can safely pass the PMF;
- Construct hydraulic improvements that would enable the dam to safely pass the PMF; or
- Adopt further restrictive operating procedures that would enable the dam (as it currently exists) to safely pass the PMF.

The proposed project is the second action listed above.

1.3.2 Project Objectives

The LCSDI project objectives are to:

- Complete the modifications to the existing LCSD facilities in compliance with the DSOD directive
- Restore the historical storage capacity of Crystal Springs Reservoir
- Improve the SFPUC's water supply delivery capability

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[3] The DSOD restrictions allow the SFPUC, with written permission, to increase the storage capacity of the reservoir and raise the water surface elevation by 4 feet (to 287.8 feet) by installing stoplogs when large storms are expected over the watershed.

- Help meet the SFPUC's dry-year delivery needs
- Facilitate planned shutdown of individual facilities for regular maintenance without interrupting customer service
- Maximize capture of local runoff from the Peninsula watershed
- Increase water storage on the Peninsula

The project objectives also include supporting the WSIP goals and objectives related to seismic reliability, delivery reliability, and water supply reliability.

1.4 Project Description

The proposed project consists of modifying various features at the top and toe of the LCSD as well as making minor changes to Sampling Station #5. The primary improvements at the top of the dam include raising the parapet wall, widening the spillway, and reshaping the crest. Sections of the parapet wall would be demolished on each side of the existing spillway; the remaining sections of the parapet wall would be strengthened by increasing the wall thickness, and the wall would be raised by 9 feet. The spillway opening on the upstream side of the dam would be widened, and the existing stoplog system would be replaced by a new concrete crest that would permanently maintain the dam crest at the higher elevation of 291.8 feet. The new spillway would promote efficient water flow, which would minimize the risk of structural damage to the dam. Drainage from the top of the dam would also be improved by filling in depressions with crushed concrete or gravel and constructing drainage channels that drain to the downstream face of the dam.

At the toe of the dam, the existing stilling basin would be demolished and replaced with a larger stilling basin. The new concrete stilling basin would be built to accommodate flows from the wider spillway. Downstream of the stilling basin, riprap grouted with concrete would be installed within the creek channel to protect the dam abutments and creek banks from erosion. The proposed stilling basin and creek bank protection improvements would be located within the riparian corridor of lower San Mateo Creek.

Sampling Station #5 is an existing facility mounted over the Pulgas Discharge Channel where water flows into Crystal Springs Reservoir, about four miles south of LCSD. The SFPUC uses the sampling station to measure the quality of water flowing through the channel. The proposed improvements to the dam would enable the SFPUC to increase the operating levels in Crystal Springs Reservoir. At its current elevation, the sampling equipment associated with Sampling Station #5 could be inundated at times under future project conditions. As part of the proposed project, the SFPUC would keep the sampling station at the same location, but would raise the sampling station above the proposed future maximum normal water surface elevation.

1.4.1 Project Construction

1.4.1.1 Construction Schedule

Construction of the proposed dam improvements is expected to take up to 14 months, including weekend work and periods with 24-hour-per-day construction. Work is scheduled to begin in early 2011 and be completed by early spring 2012, with all major construction activities scheduled to occur during the nine- month period from March through November 2011. The remaining five months in the overall construction schedule are allocated for contractor mobilization and demobilization in addition to a contingency period for corrections to construction work. In order to ensure that the LCSD has a functioning spillway and stilling basin during the rainy season and to protect public safety, construction would be completed during the dry season to the extent feasible. Therefore, the construction schedule at the LCSD site assumes that there will be multiple shifts and concurrent work at several locations using multiple crews and equipment. Construction at Sampling Station #5 would be completed in about four months during the dry season and would occur concurrently with construction at the dam site.

1.4.1.2 Construction Activities at the Top of the Dam

San Mateo County's Skyline Boulevard Bridge (also referred to as the Crystal Springs Dam Bridge) traverses the crest of, and is supported by, the LCSD. Thus, the LCSDI project would require coordination with San Mateo County for construction activities at the top of the dam. San Mateo County is currently planning to demolish the bridge and replace it with a new seismically and structurally sound bridge (San Mateo County, 2009). Under the ongoing coordination efforts between the SFPUC and San Mateo County, the construction schedule indicates that San Mateo County would first demolish the existing bridge (estimated to require 6 months); the SFPUC would then complete the dam modifications at the crest of the dam (estimated to require 14 months), and San Mateo County would complete construction of the new Skyline Boulevard Bridge (estimated to require 12 months). This section of Skyline Boulevard would be closed for the duration of construction of both the proposed project and San Mateo County's bridge replacement project.

Construction activities for the proposed project at the top of the dam would consist of demolition of the unneeded structures at the top of the dam, building temporary platforms over the existing parapet wall to support construction equipment, installing anchors to tie together existing and new portions of the wall and spillway, erecting forms for the new components, and placing concrete into the forms. Four staging and storage areas would be located at the northern and southern ends of the dam along Skyline Boulevard, in the shoulder of the roadway, and in the vista point parking lot. If determined to be necessary by the contractors, some of the construction activities could take place from a barge in the reservoir, in which case an additional staging area would be required near the existing boat ramp at Lower Crystal Springs Reservoir. Following construction, all staging areas would be restored to their preconstruction condition.

1.4.1.3 Construction Activities at the Toe of the Dam

An in-channel pool downstream from the existing stilling basin would be drained for installation of a temporary access road needed to construct the new stilling basin. This in-channel pool, a scour hole caused by past discharge from the reservoir through a now inoperable outlet pipe, would be permanently eliminated and replaced by the enlarged stilling basin. Vegetation (including trees) would be cleared through this riparian area along San Mateo Creek for the temporary access road and new stilling basin. The construction zone would be dewatered prior to and as needed during the construction of the new stilling basin. The existing stilling basin would be demolished using an excavator with a concrete breaker. If, for unforeseen conditions, conventional excavation methods are inadequate, controlled detonations (blasting) would be used as a last resort during the demolition and excavation process. After excavation is completed, the floor of the stilling basin and the wing walls and sidewalls of the basin would be formed with concrete. Riprap would be placed within the new stilling basin and in the creek channel downstream of the basin, and the riprap would be grouted in place with concrete. Clean fill would be backfilled around the completed stilling basin structure. Four staging and storage areas would be located at the toe of the dam along the existing access road. Following construction, the temporary access road would be removed and the construction zone and staging areas would be restored to their preconstruction condition.

1.4.1.4 Construction Activities at Sampling Station #5

Sampling Station #5 would be detached from the discharge channel and new concrete footings constructed at the existing location of the sampling station. A new steel-frame structure would be erected on the footings and the sampling station mounted on the new frame.

1.4.1.5 Spoils Management and Disposal

The LCSDI project is expected to produce approximately 22,000 cubic yards of excavated material consisting of soil, rock, and organic matter. Of this excavated material, an estimated 15,400 cubic yards would be suitable for use as backfill for the new stilling basin and most of it for the SFPUC Crystal Springs/San Andreas Transmission Upgrade project. The unused excavated material would be hauled to an offsite disposal area.

1.4.2 Project Operations

During the construction period, the SFPUC would operate the Crystal Springs Reservoir in a manner similar to existing practices, although the ability to release or spill water to San Mateo Creek over the spillway would be interrupted, and the reservoir levels would be lowered a few feet below the current maximum operating level of 283.8 feet. Since construction would occur during the dry season when there are typically no releases or spills, this interruption would not affect systemwide operations or customer deliveries. During the first three years following project construction, the SFPUC would gradually raise the maximum normal operating level of the reservoir in order to reduce impacts on California red-legged frog and San Francisco garter snake, two special-status species present around the perimeter of the reservoir.

The long-term operating goals for Crystal Springs Reservoir would be similar to the current goals: the SFPUC would try to keep the reservoir as full as possible without exceeding the maximum normal operating level in order to avoid uncontrolled spills and minimize releases to San Mateo Creek. However, the maximum normal operating level would be at elevation 287.8 feet, four feet higher than the current level. The SFPUC would operate Crystal Springs Reservoir similar to current operations, except that the average annual water storage and average annual water surface elevation would both increase. Seasonal water storage patterns and water surface elevation fluctuations are expected to occur in the future with the proposed project, but would be similar to those in the recent past. Maximum water storage would occur in the spring, and minimum storage would be expected in the fall. Water level fluctuations would be about the same as under the existing condition. Similar to the current operations, the SFPUC would allow the reservoir to exceed the maximum normal water surface elevation occasionally to accommodate large storms over the watershed. Exceedances could raise the reservoir level elevations up to a maximum of 291.8 feet, and would be expected to occur primarily after March 1 when the SFPUC begins eliminating the winter flood reservation in the reservoir as the rainy season ends.

Post-construction maintenance of the dam and reservoir would be generally similar to current practices, but would include regular cleaning of the stilling basin.

1.5 Summary of Project Environmental Impacts and Mitigation Measures

Chapter 5 of this EIR presents the environmental impact analyses for all CEQA environmental resource topics, and Chapter 6 presents mitigation measures that would reduce significant impacts to a less-than-significant level, when feasible. A summary of all project-level impacts and mitigation measures is provided in **Table 1-1** at the end of this chapter.

In addition, because the proposed project is part of the WSIP, it would also contribute to the water supply and system operations impacts identified in the PEIR and summarized in Section 1.2.2.3 above (see also WSIP PEIR Chapter 5, which is incorporated by reference into this EIR). As described above in Section 1.2.2.3, the potentially significant and significant unavoidable water supply and system operations impacts identified in the PEIR have subsequently been analyzed in project-level EIRs based on more detailed information, and these analyses supersede any contrary impact conclusions in the PEIR. All other impacts resulting from implementation of the WSIP water supply strategy can be mitigated to a less-than-significant level through mitigation measures identified in the PEIR (see WSIP PEIR Chapter 6, which is incorporated by reference into this EIR).

As discussed in Chapter 7 of this EIR (Section 7.1, Growth-Inducing Impacts), the proposed project is one of several facility improvement projects that constitute the SFPUC's WSIP. The WSIP PEIR determined that implementation of the WSIP would support growth in the SFPUC service area, thereby contributing indirectly to environmental impacts caused by that growth. Because the proposed project is part of the WSIP and would contribute to the WSIP's growth-inducement impact, the project therefore would contribute to the potentially significant and unavoidable program-level impacts associated with growth inducement (see WSIP PEIR Chapter 7, which is incorporated by reference, and summarized in Section 7.1 of this EIR).

1.6 Alternatives to the Proposed Project

Chapter 8 of this EIR identifies the following two alternatives as providing a reasonable range of alternatives under CEQA: the No Project Alternative and the Lowered Spillway Crest Alternative. These alternatives are evaluated in detail and in comparison to the proposed project. Prior to selecting these two alternatives for detailed evaluation, numerous alternative concepts were considered but rejected because they did not meet most of the project objectives, would not lessen the impacts of the proposed project, and/or were determined to be infeasible.

The CEQA Guidelines require the identification of an environmentally superior alternative (Section 15126.6[e]). If the "no project" alternative is the environmentally superior alternative, then the EIR must also identify an environmentally superior alternative among the other alternatives (Section 15126.6[e]).

Neither of the two alternatives would achieve all of the project objectives, nor would they be consistent with the WSIP goals and objectives. As described in Chapter 8, while the No Project Alternative would avoid all construction-related impacts and all significant, unavoidable impacts identified for the proposed project, failure to take action would result in the SFPUC's continued requirement to comply with DSOD operating restrictions on Crystal Springs Reservoir. It is reasonably foreseeable that if implemented, the No Project Alternative would lead to future, more restrictive requirements from the DSOD, further inhibiting the SFPUC's ability to achieve the WSIP goals and system performance objectives. Furthermore, the No Project Alternative would potentially result in adverse environmental impacts on biological and visual resources different from those of the proposed project, as well as indirect impacts associated with the potential for the SFPUC or its customers to secure alternative water supplies.

The Lowered Spillway Crest Alternative would achieve some but not all of the project objectives; it would not be consistent with the WSIP goals and objectives. On average, compared to the proposed project, it would reduce storage in Crystal Springs Reservoir by 1 billion gallons and reduce the systemwide operational flexibility. This alternative would have similar impacts to those of the proposed project, including all of the same construction impacts and the same long-term operational impacts on biological and visual resources (including all wetland impacts) up to elevation 287.8 feet. It would have all the same significant, unavoidable impacts as the proposed project. However, the Lowered Spillway Crest Alternative would lessen the predicted operational impacts on oak woodlands (from 31.6 to 19.6 acres) and visual quality with regard to impacts predicted to occur at elevations higher than 287.8 feet. The Lowered Spillway Crest Alternative is considered the environmentally superior alternative.

1.7 Significant and Unavoidable, and Potentially Significant and Unavoidable Impacts of the Proposed Project

This EIR provides a project-level evaluation of the potential environmental impacts associated with project construction and operations. In most cases, potentially significant and significant impacts identified in this EIR would be reduced to a less-than-significant level with implementation of the recommended mitigation measures. However, the following significant and unavoidable, and potentially significant and unavoidable, impacts were identified because no feasible mitigation measures could reduce the impacts to a less-than-significant level: Impact AE-4 (long-term visual effects due to inundation of shoreline woodlands); Impact CP-1 (design and construction effects on the integrity of a historic resource); Impact NO-1 (construction-related noise increases); and Impact NO-3 (noise disturbance along construction haul routes). In addition, the proposed project's contribution to cumulative impacts would be potentially significant and unavoidable in the areas of historic resources (Impact C-CP), construction noise (Impact C-NO), and recreational impacts during construction (Impact C-RE).

This EIR evaluates air quality impacts using both the adopted and proposed guidelines of the Bay Area Air Quality Management District (BAAQMD). In the event that the BAAQMD adopts the proposed thresholds (which would then supersede the adopted thresholds), this EIR determined that the proposed project would result in significant and unavoidable impacts on air quality: Impact AQ-1 (construction emissions of criteria pollutants and ozone precursors) and Impact C-AQ (cumulative air quality emissions from construction).

1.8 Areas of Controversy

No areas of scientific or technical controversy have been identified for this project. During the scoping meeting, held on January 18, 2007, meeting attendees commented on the scope of the EIR. Written comments were also received during the scoping period between January 2 and February 1, 2007. A scoping report was prepared that provides a summary of the comments received on the project, including a transcript of the oral testimony at the January 2007 scoping session (San Francisco Planning Department, 2007). Refer to Table 2-2 in Chapter 2, Introduction and Background, of this report for an overview of environmental concerns raised during the scoping period.

TABLE 1-1
SUMMARY OF LCSDI IMPACTS AND MITIGATION MEASURES

IMPACT	LCSD Site	Sampling Station Site
Section 5.2: Land Use and Land Use Planning		
Impact LU-1: Temporary disruption or displacement of existing land uses during construction.	PSM	PSM
Mitigation Measures		
M-LU-1a: Neighborhood Notice	X	X
M-LU-1b: Event Scheduling at the Pulgas Water Temple	--	X
M-TR-1: Traffic Control Plan	X	--
M-NO-1: Administrative and Source Controls	X	--
M-NO-4: Blasting Noise Controls	X	--
M-AQ-1a: Dust Control Measures	X	X
M-AQ-1b: Exhaust Control Measures	X	X
M-AQ-1c: Additional Exhaust Control Measures	X	X
Impact LU-2: Permanent displacement or long-term disruption of existing land uses.	LS	LS
Mitigation Measures		
None required.	--	--
Impact C-LU: Cumulative disruption of established communities and changes in existing land use patterns.	LS	LS
Mitigation Measures		
None required.	--	--
Section 5.3: Aesthetics		
Impact AE-1: Construction-related impacts on scenic resources (vistas, roadways, and designated scenic areas) or the visual character of the site and its surroundings.	PSM	N/A
Mitigation Measures		
M-AE-1: Landscaping Plan	X	--
Impact AE-2: Effects of light or glare during nighttime construction.	PSM	N/A
Mitigation Measures		
M-AE-2: Site-Specific Construction Lighting Plan and Complaint Line	X	--
Impact AE-3: Permanent impacts on scenic resources (vistas, roadways, and designated scenic areas) or the visual character of the site and its surroundings.	LS	N/A
Mitigation Measures		
None required.	--	--

B = Beneficial impact
N/A = Not Applicable or no impact
LS = Less than Significant impact, no mitigation required
SM = Significant impact, can be Mitigated to less than significant
PSM = Potentially Significant impact, can be Mitigated to less than significant
SU = Significant Unavoidable impact
PSU = Potentially Significant Unavoidable impact
X = Mitigation applies
-- = Mitigation not required

TABLE 1-1 (Continued)
SUMMARY OF LCSDI IMPACTS AND MITIGATION MEASURES

IMPACT	LCSD Site	Sampling Station Site
Section 5.3: Aesthetics (cont.)		
Impact AE-4: Long-term visual effects due to inundation of shoreline woodlands.	PSU	N/A
Mitigation Measures		
M-AE-4: Tree Removal Plan	X	--
M-BI-1a: Worker Training Program	X	--
M-BI-1b: Avoidance and Restoration	X	--
M-BI-2: Individual Tree Replacement	X	--
M-BI-3c: Biological Monitoring	X	--
M-BI-3d: Preconstruction Surveys and Avoidance of Nesting Birds	X	--
M-BI-3g: General Avoidance Measures	X	--
M-HY-3: Preparation and Implementation of a SWPPP	X	--
Impact C-AE: Cumulative impacts on scenic resources (vistas, roadways, and designated scenic areas) or the visual character of the site and its surroundings.	LS	N/A
Mitigation Measures		
None required.	--	--
Section 5.4: Population and Housing		
No impacts related to growth-inducement and housing.	N/A	N/A
Mitigation Measures		
None required.	--	--
Section 5.5: Cultural and Paleontological Resources		
Impact CP-1: Design and construction effects on the integrity of a historic resource.	SU	N/A
Mitigation Measures		
M-CP-1a: HAER Recordation and Public Interpretation	X	--
M-CP-1b: Historic Resources Protection Plan	X	--
Impact CP-2: Design and construction effects on a historic district.	N/A	N/A
Mitigation Measures		
None required.	--	--
Impact CP-3: Construction impacts on unrecorded archaeological resources.	PSM	PSM
Mitigation Measures		
M-CP-3: Procedures Addressing Inadvertent Discovery of Archaeological Resources	X	X

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SU = Significant Unavoidable impact
PSU = Potentially Significant Unavoidable impact
X = Mitigation applies
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TABLE 1-1 (Continued)
SUMMARY OF LCSDI IMPACTS AND MITIGATION MEASURES

IMPACT	LCSD Site	Sampling Station Site
Section 5.5: Cultural and Paleontological Resources (cont.)		
Impact CP-4: Construction impacts on paleontological resources.	PSM	LS
Mitigation Measures		
M-CP-4: Procedures Addressing Unanticipated Discovery of a Paleontological Resource	X	--
Impact CP-5: Construction impacts on human remains, including those interred outside of formal cemeteries.	PSM	PSM
Mitigation Measures		
M-CP-5: Procedures Addressing Inadvertent Discovery of Human Remains	X	X
Impact CP-6: Effects of project operations on historic, archaeological, or paleontological resources or human remains	PSM	N/A
Mitigation Measures		
M-CP-6: Conduct a Geotechnical Study to Evaluate the Condition of the Retaining Wall, and if Necessary, Relocate and Extend the South Crystal Springs Cottage Retaining Wall.	X	--
Impact C-CP: Cumulative impacts on cultural resources.	SU	N/A
Mitigation Measures		
M-CP-1a: HAER Recordation and Public Interpretation	X	--
Section 5.6: Transportation and Circulation		
Impact TR-1: Temporary reduction in roadway capacity and increases in traffic delays.	PSM	LS
Mitigation Measures		
M-TR-1: Traffic Control Plan	X	--
Impact TR-2: Short-term traffic increases on roadways due to construction-related vehicle trips.	PSM	LS
Mitigation Measures		
M-TR-1: Traffic Control Plan	X	--
Impact TR-3: Impaired access to adjacent roadways and land uses.	PSM	LS
Mitigation Measures		
M-TR-1: Traffic Control Plan	X	--
Impact TR-4: Temporary displacement of on-street parking at some locations due to increased parking demand or construction within roadways.	LS	LS
Mitigation Measures		
None required.	--	--

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PSM = Potentially Significant impact, can be Mitigated to less than significant
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TABLE 1-1 (Continued)
SUMMARY OF LCSDI IMPACTS AND MITIGATION MEASURES

IMPACT	LCSD Site	Sampling Station Site
Section 5.6: Transportation and Circulation (cont.)		
Impact TR-5: Increased potential traffic safety hazards for vehicles, bicyclists, and pedestrians on public roadways during construction.	PSM	LS
Mitigation Measures		
M-TR-1: Traffic Control Plan	X	--
Impact TR-6: Increases in vehicle trips to and from project facilities for operation and maintenance.	LS	LS
Mitigation Measures		
None required.	--	--
Impact C-TR: Cumulative traffic increases on local and regional roads.	PSM	LS
Mitigation Measures		
M-C-TR: Coordinated Peninsula Regional Transportation Management Plan	X	--
Section 5.7: Noise and Vibration		
Impact NO-1: Disturbance from temporary, construction-related, on-site noise increases.	SU	PSM
Mitigation Measures		
M-NO-1: Administrative and Source Controls	X	--
M-LU-1b: Event Scheduling at the Pulgas Water Temple	--	X
Impact NO-2: Consistency with noise ordinance limits.	SM	LS
Mitigation Measures		
M-NO-1: Administrative and Source Controls	X	--
Impact NO-3: Temporary noise disturbance along construction haul routes.	SU	LS
Mitigation Measures		
None feasible.	--	--
Impact NO-4: Noise disturbance due to construction-related blasting.	SM	N/A
Mitigation Measures		
M-NO-4: Blasting Noise Controls	X	--
Impact NO-5: Temporary disturbance due to construction-related vibration.	LS	LS
Mitigation Measures		
None required.	--	--

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N/A = Not Applicable or no impact
LS = Less than Significant impact, no mitigation required
SM = Significant impact, can be Mitigated to less than significant
PSM = Potentially Significant impact, can be Mitigated to less than significant
SU = Significant Unavoidable impact
PSU = Potentially Significant Unavoidable impact
X = Mitigation applies
-- = Mitigation not required

TABLE 1-1 (Continued)
SUMMARY OF LCSDI IMPACTS AND MITIGATION MEASURES

IMPACT	LCSD Site	Sampling Station Site
Section 5.7: Noise and Vibration (cont.)		
Impact NO-6: Disturbance due to noise and vibration increases associated with the operation of project facilities.	LS	LS
Mitigation Measures		
None required.	--	--
Impact C-NO: Cumulative increases in construction noise in the LCSD vicinity and along construction haul and delivery routes.	PSU	LS
Mitigation Measures		
M-C-NO: Coordinated Noise Control Plan	X	--
Section 5.8: Air Quality[1]		
Impact AQ-1: Construction emissions of criteria pollutants.	PSM/SU	PSM/SU
Mitigation Measures		
M-AQ-1a: Dust Control Measures	X	X
M-AQ-1b: Exhaust Control Measures	X	X
M-AQ-1c: Additional Exhaust Control Measures	X	X
Impact AQ-2: Generation of diesel particulate matter (DPM) and toxic air contaminants (TACs) during construction.	LS/LS	LS/LS
Mitigation Measures		
None required.	--	--
Impact AQ-3: Odors generated during project construction.	LS/LS	LS/LS
Mitigation Measures		
None required.	--	--
Impact AQ-4: GHG construction emissions and conflicts with any applicable plans, policies, or regulations adopted for the purpose of reducing GHG emissions.	LS/LS	LS/LS
Mitigation Measures		
None required.	--	--
Impact AQ-5: Air pollutant and odor emissions during project operation.	LS/LS	LS/LS
Mitigation Measures		
None required.	--	--

[1] For all Air Quality impacts, two significance determinations are provided. The first determination is based on evaluation with the adopted 1999 BAAQMD guidelines and the second is based on evaluation with proposed 2009 BAAQMD CEQA Air Quality Guidelines.

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TABLE 1-1 (Continued)
SUMMARY OF LCSDI IMPACTS AND MITIGATION MEASURES

IMPACT	LCSD Site	Sampling Station Site
Section 5.8: Air Quality (cont.)		
Impact AQ-6: GHG operational emissions and conflicts with any applicable plans, policies, or regulations adopted for the purpose of reducing GHG emissions.	LS/LS	N/A
Mitigation Measures		
None required.	--	--
Impact C-AQ: Cumulative construction emissions of criteria pollutants, toxic air contaminants, and greenhouse gas emissions.	LS/SU	LS/SU
Mitigation Measures		
M-AQ-1a: Dust Control Measures	X	X
M-AQ-1b: Exhaust Control Measures	X	X
M-AQ-1c: Additional Exhaust Control Measures	X	X
Section 5.9: Wind and Shadow		
No impacts related to wind and shadow.	N/A	N/A
Mitigation Measures		
None required.	--	--
Section 5.10: Recreation		
Impact RE-1: Temporary conflicts with established recreational resources during construction.	SM	LS
Mitigation Measures		
M-RE-1: Notify Bicycle Organizations of Detours	X	--
M-NO-1: Administrative and Source Controls	X	--
M-AQ-1a: Dust Control Measures	X	X
M-AQ-1b: Exhaust Control Measures	X	X
M-AQ-1c: Additional Exhaust Control Measures	X	X
M-TR-1: Traffic Control Plan	X	--
M-LU-1b: Event Scheduling at the Pulgas Water Temple	--	X
Impact RE-2: Conflicts with established recreational uses due to facility siting and project operation.	LS	LS
Mitigation Measures		
M-AE-4: Tree Removal Plan	X	X

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TABLE 1-1 (Continued)
SUMMARY OF LCSDI IMPACTS AND MITIGATION MEASURES

IMPACT	LCSD Site	Sampling Station Site
Section 5.10: Recreation (cont.)		
Impact C-RE: Cumulative effects on recreational resources during construction.	SU	LS
Mitigation Measures		
M-LU-1b: Event Scheduling at Pulgas Water Temple	--	X
M-TR-1: Traffic Control Plan	X	--
M-C-TR: Coordinated Peninsula Regional Transportation Management Plan	X	--
M-RE-1: Notify Bicycle Organizations of Detours	X	--
M-AQ-1a: Dust Control Measures	X	X
M-AQ-1b: Exhaust Control Measures	X	X
M-AQ-1c: Additional Exhaust Control Measures	X	X
M-NO-1: Administrative and Source Controls	X	--
M-C-RE: Coordinate Trail Access for Sawyer Camp Trail during Construction	X	--
Section 5.11: Utilities and Service Systems		
Impact UT-1: Potential temporary damage to or disruption of existing regional and local utilities.	PSM	LS
Mitigation Measures		
M-UT-1: Coordinate Final Construction Plans with Affected Utilities	X	--
Impact UT-2: Impacts related to the relocation of utilities.	PSM	N/A
Mitigation Measures		
M-UT-1: Coordinate Final Construction Plans with Affected Utilities	X	--
Impact UT-3: Temporary adverse effects on solid waste landfill capacity.	LS	LS
Mitigation Measures		
None required.	--	--
Impact UT-4: Impacts related to compliance with federal, state, and local solid waste statutes.	PSM	LS
Mitigation Measures		
M-UT-4: Waste Management Plan	X	--
Impact UT-5: Long-term effects on utilities and service systems.	LS	N/A
Mitigation Measures		
None required.	--	--

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TABLE 1-1 (Continued)
SUMMARY OF LCSDI IMPACTS AND MITIGATION MEASURES

IMPACT	LCSD Site	Sampling Station Site
Section 5.11: Utilities and Service Systems (cont.)		
Impact C-UT: Cumulative impacts on utilities and service systems.	N/A	N/A
Mitigation Measures		
None required.	--	--
Section 5.12: Public Services		
No impacts related to public services.	N/A	N/A
Mitigation Measures		
None required.	--	--
Section 5.13: Biological Resources		
Impact BI-1: Construction impacts on wetlands, aquatic resources, and riparian habitat.	SM	SM
Mitigation Measures		
M-BI-1a: Worker Training Program	X	X
M-BI-1b: Avoidance and Restoration	X	X
M-BI-1c: Wetlands Creation and Enhancement for Construction and Operational Impacts	X	X
M-HY-3: Preparation and Implementation of a SWPPP	X	X
Impact BI-2: Construction impacts on sensitive habitats, common habitats, and county-designated significant trees.	SM	LS
Mitigation Measures		
M-BI-2: Tree Replacement	X	--
M-BI-1a: Worker Training Program	X	--
M-BI-1b: Avoidance and Restoration	X	--
M-BI-3g: General Avoidance Measures	X	--
Impact BI-3: Construction impacts on special-status species—direct mortality and/or habitat effects.	SM	SM
Mitigation Measures		
M-BI-3a: Frog Relocation	X	--
M-BI-3b: Exclusion Fence	X	--
M-BI-3c: Biological Monitor	X	X
M-BI-3d: Preconstruction Surveys and Avoidance of Nesting Birds	X	X
M-BI-3e: Avoidance of Roosting Bats	X	--

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TABLE 1-1 (Continued)
SUMMARY OF LCSDI IMPACTS AND MITIGATION MEASURES

IMPACT	LCSD Site	Sampling Station Site
Section 5.13: Biological Resources (cont.)		
M-BI-3f: Preconstruction Surveys and Avoidance of Woodrat Middens during Breeding	X	--
M-BI-3g: General Avoidance Measures	X	X
M-BI-1a: Worker Training Program	X	X
M-BI-1b: Avoidance and Restoration	X	X
M-BI-1c: Wetlands Creation and Enhancement for Construction and Operational Impacts	X	--
Impact BI-4: Construction water discharge effects on riparian and/or aquatic resources.	LS	N/A
Mitigation Measures		
None required.	--	--
Impact BI-5: Conflicts with local policies or ordinances protecting biological resources due to construction impacts.	SM	LS
Mitigation Measures		
M-BI-2: Tree Replacement	X	--
M-BI-1a: Worker Training Program	X	--
Impact BI-6: Operational impacts on wetlands and aquatic resources.	SM	N/A
Mitigation Measures		
M-BI-1a: Worker Training Program	X	--
M-BI-1b: Avoidance and Restoration	X	--
M-BI-1c: Wetland Creation and Enhancement for Construction and Operational Effects	X	--
Impact BI-7: Operational impacts on sensitive habitats, common habitats, and significant trees.	SM	N/A
Mitigation Measures		
M-BI-7a: Serpentine Grassland Enhancements	X	--
M-BI-7b: Oak Woodland Mitigation Program	X	--
Impact BI-8: Operational impacts on special-status species—direct mortality and/or habitat effects.	SM	N/A
Mitigation Measures		
M-BI-1a: Worker Training Program	X	--
M-BI-1c: Wetland Creation and Enhancement for Construction and Operational Effects	X	--
M-BI-7a: Serpentine Grassland Enhancements	X	--
M-BI-7b: Oak Woodland Mitigation Program	X	--
M-BI-8a: Listed and Nonlisted Special-status Plants	X	--

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TABLE 1-1 (Continued)
SUMMARY OF LCSDI IMPACTS AND MITIGATION MEASURES

IMPACT	LCSD Site	Sampling Station Site
Section 5.13: Biological Resources (cont.)		
M-BI-8b: Scrub and Grassland Enhancement for Upland Refugia	X	--
M-BI-8c: Predator (Bullfrog) Control	X	--
Impact BI-9: Operational water discharge effects on riparian and/or aquatic resources.	LS	N/A
Mitigation Measures		
None required.	--	--
Impact BI-10: Conflicts with local policies or ordinances protecting biological resources due to proposed operations.	SM	N/A
Mitigation Measures		
M-BI-7b: Oak Woodland Mitigation Program	X	--
Impact C-BI: Cumulative loss of sensitive biological resources during construction and operation.	PSM	PSM
Mitigation Measures		
M-C-BI: Coordination of Exclusion Fence and Biological Monitoring	X	X
M-BI-3b: Exclusion Fence	X	X
M-BI-3c: Biological monitoring	X	X
Impact BI-11: Construction impacts on fisheries due to water quality effects from increased sediment and turbidity and contaminant releases.	PSM	N/A
Mitigation Measures		
M-BI-1a: Worker Training Program	X	--
M-BI-1b: Avoidance and Restoration	X	--
M-HY-3: Preparation and Implementation of a SWPPP	X	--
Impact BI-12: Disturbance and direct injury to steelhead from construction.	SM	N/A
Mitigation Measures		
M-BI-12a: Fish Rescue and Relocation	X	--
M-BI-12b: Vibration Monitoring	X	--
M-BI-1a: Worker Training Program	X	--
M-BI-1b: Avoidance and Restoration	X	--
M-BI-3b: Exclusion Fence	X	--
M-BI-3c: Biological monitor	X	--
M-BI-3g: General Avoidance Measures	X	--

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TABLE 1-1 (Continued)
SUMMARY OF LCSDI IMPACTS AND MITIGATION MEASURES

IMPACT	LCSD Site	Sampling Station Site
Section 5.13: Biological Resources (cont.)		
Impact BI-13: Loss of riparian vegetation, shaded riverine aquatic cover, and aquatic habitat area.	SM	N/A
Mitigation Measures		
M-BI-13: Enhancement of Existing Fisheries Habitat	X	--
Impact BI-14: Reduction in streamflows downstream of construction area	LS	N/A
Mitigation Measures		
None required.	--	--
Impact BI-15: Inundation of approximately 1,500 linear feet of riverine habitat.	LS	N/A
Mitigation Measures		
None required.	--	--
Impact C2-BI: Cumulative impacts on fisheries.	LS	N/A
Mitigation Measures		
None required.	--	--
Section 5.14: Geology and Soils		
Impact GE-1: Slope instability during construction.	LS	LS
Mitigation Measures		
None required	--	--
Impact GE-2: Erosion and loss of topsoil.	PSM	LS
Mitigation Measures		
M-GE-2: Replacement of Topsoil	X	--
Impact GE-3: Surface fault rupture.	LS	LS
Mitigation Measures		
None required.	--	--
Impact GE-4: Seismically induced groundshaking.	LS	LS
Mitigation Measures		
None required.	--	--
Impact GE-5: Seismically induced ground failure, including liquefaction, lateral spreading, and settlement.	LS	LS
Mitigation Measures		
None required.	--	--

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TABLE 1-1 (Continued)
SUMMARY OF LCSDI IMPACTS AND MITIGATION MEASURES

IMPACT	LCSD Site	Sampling Station Site
Section 5.14: Geology and Soils (cont.)		
Impact GE-6: Seismically induced landslides or other slope failures.	LS	LS
Mitigation Measures		
None required.	--	--
Impact C-GE: Cumulative impacts on geology, soils, and seismicity.	LS	LS
Mitigation Measures		
None required.	--	--
Section 5.15: Hydrology and Water Quality		
Impact HY-1: Construction-related impacts on flow along lower San Mateo Creek.	LS	N/A
Mitigation Measures		
None required.	--	--
Impact HY-2: Construction-related impacts on groundwater levels in the vicinity of Crystal Springs Reservoir and the LCSD.	LS	N/A
Mitigation Measures		
None required.	--	--
Impact HY-3: Construction-related impact on water quality in Crystal Springs Reservoir and along lower San Mateo Creek.	PSM	PSM
Mitigation Measures		
M-HY-3: Preparation and Implementation of a SWPPP	X	X
Impact HY-4: Construction-related impacts on the geomorphology along San Mateo Creek, San Andreas, and Laguna Creeks.	LS	N/A
Mitigation Measures		
None required.	--	--
Impact HY-5: Long-term effects on flow along lower San Mateo Creek.	LS	N/A
Mitigation Measures		
None required.	--	--
Impact HY-6: Increased flood hazards along lower San Mateo Creek during project operations.	B	N/A
Mitigation Measures		
None required.	--	--

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TABLE 1-1 (Continued)
SUMMARY OF LCSDI IMPACTS AND MITIGATION MEASURES

IMPACT	LCSD Site	Sampling Station Site
Section 5.15: Hydrology and Water Quality (cont.)		
Impact HY-7: Long-term effects on groundwater levels and quality in the vicinity of Crystal Springs Reservoir and the LCSD.	LS	N/A
Mitigation Measures		
None required.	--	--
Impact HY-8: Long-term impacts on water quality in San Mateo, San Andreas, and Laguna Creeks, and Crystal Springs Reservoir.	LS	N/A
Mitigation Measures		
None required.	--	--
Impact HY-9: Operational effects on the geomorphology along San Mateo, San Andreas, and Laguna Creeks.	LS	N/A
Mitigation Measures		
None required.	--	--
Impact C-HY: Cumulative impacts on water quality and hydrology.	LS	N/A
Mitigation Measures		
None required.	--	--
Section 5.16: Hazards and Hazardous Materials		
Impact HZ-1: Potential to encounter hazardous materials in soil and groundwater.	LS	LS
Mitigation Measures		
None required.	--	--
Impact HZ-2: Exposure to naturally occurring asbestos.	SM	LS
Mitigation Measures		
M-HZ-2a: Conduct Investigation for Naturally Occurring Asbestos	X	--
M-HZ-2b: Asbestos Dust Mitigation Plan	X	--
Impact HZ-3: Exposure to hazardous building materials.	SM	LS
Mitigation Measures		
M-HZ-3: Implement DTSC Alternative Management Standards for Treated Wood Waste	X	--
Impact HZ-4: Accidental hazardous materials release from construction equipment.	PSM	PSM
Mitigation Measures		
M-HY-3: Preparation and Implementation of a SWPPP	X	X

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TABLE 1-1 (Continued)
SUMMARY OF LCSDI IMPACTS AND MITIGATION MEASURES

IMPACT	LCSD Site	Sampling Station Site
Section 5.16: Hazards and Hazardous Materials (cont.)		
Impact HZ-5: Risk of fires during construction.	LS	LS
Mitigation Measures		
None required.	--	--
Impact HZ-6: Fire and safety hazards from the use of explosives during construction.	LS	N/A
Mitigation Measures		
None required.	--	--
Impact HZ-7: Operational impacts related to hazards and hazardous materials.	LS	N/A
Mitigation Measures		
None required.	--	--
Impact C-HZ: Cumulative impacts related to hazards and hazardous materials.	LS	LS
Mitigation Measures		
None required.	--	--
Section 5.17: Mineral and Energy Resources		
Impact ME-1: Construction-related energy use.	LS	LS
Mitigation Measures		
None required.	--	--
Impact C-ME: Cumulative impacts on energy use.	LS	LS
None required.	--	--
Section 5.18: Agricultural Resources		
No impacts related to agricultural resources.	N/A	N/A
Mitigation Measures		
None required.	--	--

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1.9 References

San Mateo County, *Crystal Springs Dam Bridge Replacement Project, Initial Study with Proposed Mitigated Negative Declaration*, September 11, 2009

San Francisco Planning Department, *Lower Crystal Springs Dam Improvements Project Public Scoping Summary Report*, March 2007.

San Francisco Planning Department, *Final Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program*, File No. 2005.0159E, State Clearinghouse No. 2005092026. Certified October 30, 2008.

San Francisco Planning Department, *Draft Environmental Impact Report for the San Francisco Public Utilities Commission's Calaveras Dam Replacement Project*, File No. 2005.0161E, State Clearinghouse No. 2005102102. October 6, 2009.

San Francisco Public Utilities Commission (SFPUC), SFPUC Resolution 08-200, Water System Improvement Program California Environmental Quality Act Findings: Findings of Fact, Evaluation of Mitigation Measures and Alternatives, and Statement of Overriding Considerations, October 2008.

CHAPTER 2

Introduction and Background

Sections

2.1 Introduction
2.2 Background – WSIP and the Regional Water System
2.3 Purpose of this EIR
2.4 CEQA Process and Public Outreach
2.5 Organization of this EIR
2.6 References

Figures

2-1 SFPUC Regional Water System
2-2 SFPUC Water Supply Watersheds
2-3 SFPUC Water Service Area
2-4 Peninsula Watershed Facilities

Tables

2-1 WSIP Goals and Objectives
2-2 Summary of Scoping Comments

2.1 Introduction

The San Francisco Public Utilities Commission (SFPUC) is proposing to implement the Lower Crystal Springs Dam Improvements project (LCSDI or project) to comply with requirements of the California Department of Water Resources, Division of Safety of Dams (DSOD) and to restore the historical storage capacity of Crystal Springs Reservoir. The DSOD requires that the SFPUC make structural improvements to Lower Crystal Springs Dam (LCSD) that would enable the dam to safely pass the Probable Maximum Flood (PMF). The project would consist of modifying various components of the LCSD, including widening the spillway, raising the parapet wall, and constructing a new stilling basin. In addition, as an ancillary project component, a water quality sampling station located at the Pulgas Discharge Channel would be raised to accommodate the proposed changes in reservoir operations and associated increase in water surface elevations. Following completion of the proposed improvements, the SFPUC proposes to modify operations of Crystal Springs Reservoir such that the maximum normal water surface elevation would be 287.8 feet, which is 4 feet above its current level and 4 feet below the historical maximum level.

2.2 Background – WSIP and the Regional Water System

2.2.1 SFPUC Regional Water System Overview

The City and County of San Francisco (CCSF), through the SFPUC, owns and operates a regional water system that extends from the Sierra Nevada to San Francisco and serves drinking water to

2.4 million people in San Francisco, San Mateo, Santa Clara, Alameda, and Tuolumne Counties. The regional water system consists of water conveyance, treatment, and distribution facilities, and delivers water to retail and wholesale customers. The existing system includes over 280 miles of pipelines, over 60 miles of tunnels, 11 reservoirs, 5 pump stations, and 2 water treatment plants. The SFPUC currently delivers an annual average of about 265 million gallons per day of water to its customers. The source of the water supply is a combination of local supplies from streamflow and runoff in the Alameda Creek watershed and in the San Mateo Creek and Pilarcitos Creek watersheds (referred to together as the Peninsula watershed), which is augmented with imported supplies from the Tuolumne River watershed. Local watersheds provide about 15 percent of total supplies and the Tuolumne River provides the remaining 85 percent. **Figure 2-1** illustrates the general location of the SFPUC regional system, and **Figure 2-2** shows the location of the water supply watersheds.

The SFPUC serves about one-third of its water supplies directly to retail customers, primarily in San Francisco, and about two-thirds of its water supplies to wholesale customers by contractual agreement. The wholesale customers are largely represented by the Bay Area Water Supply and Conservation Agency (BAWSCA), which consists of 27 total customers, shown on **Figure 2-3**.[1] Some of these wholesale customers have other sources of water in addition to what they receive from the SFPUC regional water system, while others rely completely on the SFPUC for supply.

2.2.2 SFPUC Water System Improvement Program

On October 30, 2008, the SFPUC adopted a Water System Improvement Program (WSIP) (known as the "Phased WSIP Variant") and the WSIP goals and objectives (SFPUC Resolution 08-200 [SFPUC, 2008]). The adopted WSIP will improve the reliability of the regional water system with respect to water quality, seismic response, and water delivery based on a planning horizon through the year 2030. The WSIP will also improve the regional system with respect to water supply to meet water delivery needs in the service area through the year 2018. The program area spans seven counties—Tuolumne, Stanislaus, San Joaquin, Alameda, Santa Clara, San Mateo, and San Francisco.

The WSIP includes a water supply strategy, modifications to system operations, and construction of a series of facility infrastructure improvement projects. The proposed LCSDI project, along with several other facility improvement projects, is a component of the WSIP. The overall goals of the WSIP are to maintain high-quality water; reduce vulnerability to earthquakes; increase delivery reliability and improve the ability to maintain the system; meet customer purchase requests in nondrought and drought periods; enhance sustainability in all system activities; and achieve a cost-effective, fully operational system (see **Table 2-1**). To further these program goals, the WSIP also includes objectives that address system performance in the areas of water quality, seismic reliability, delivery reliability, and water supply.

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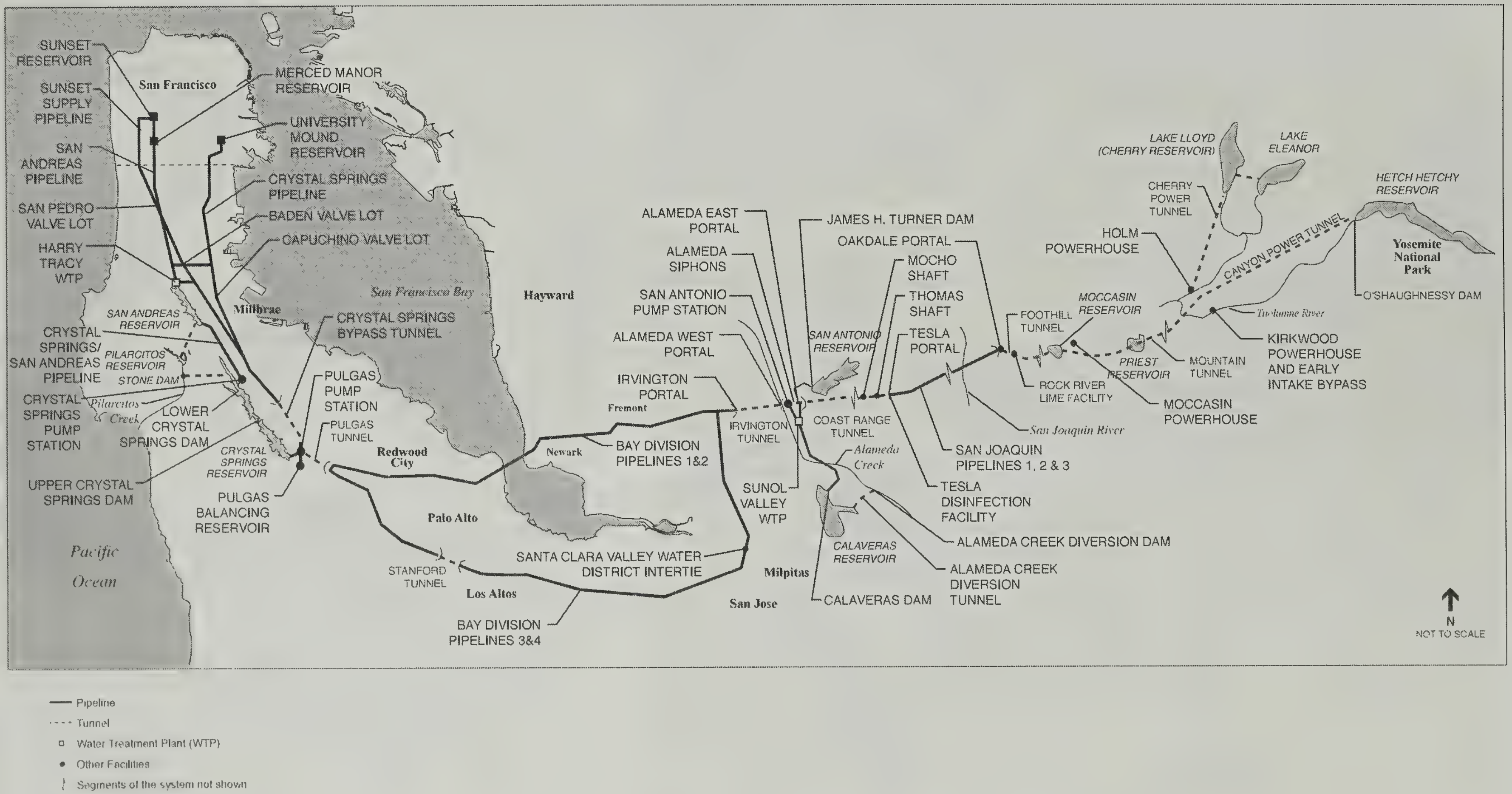
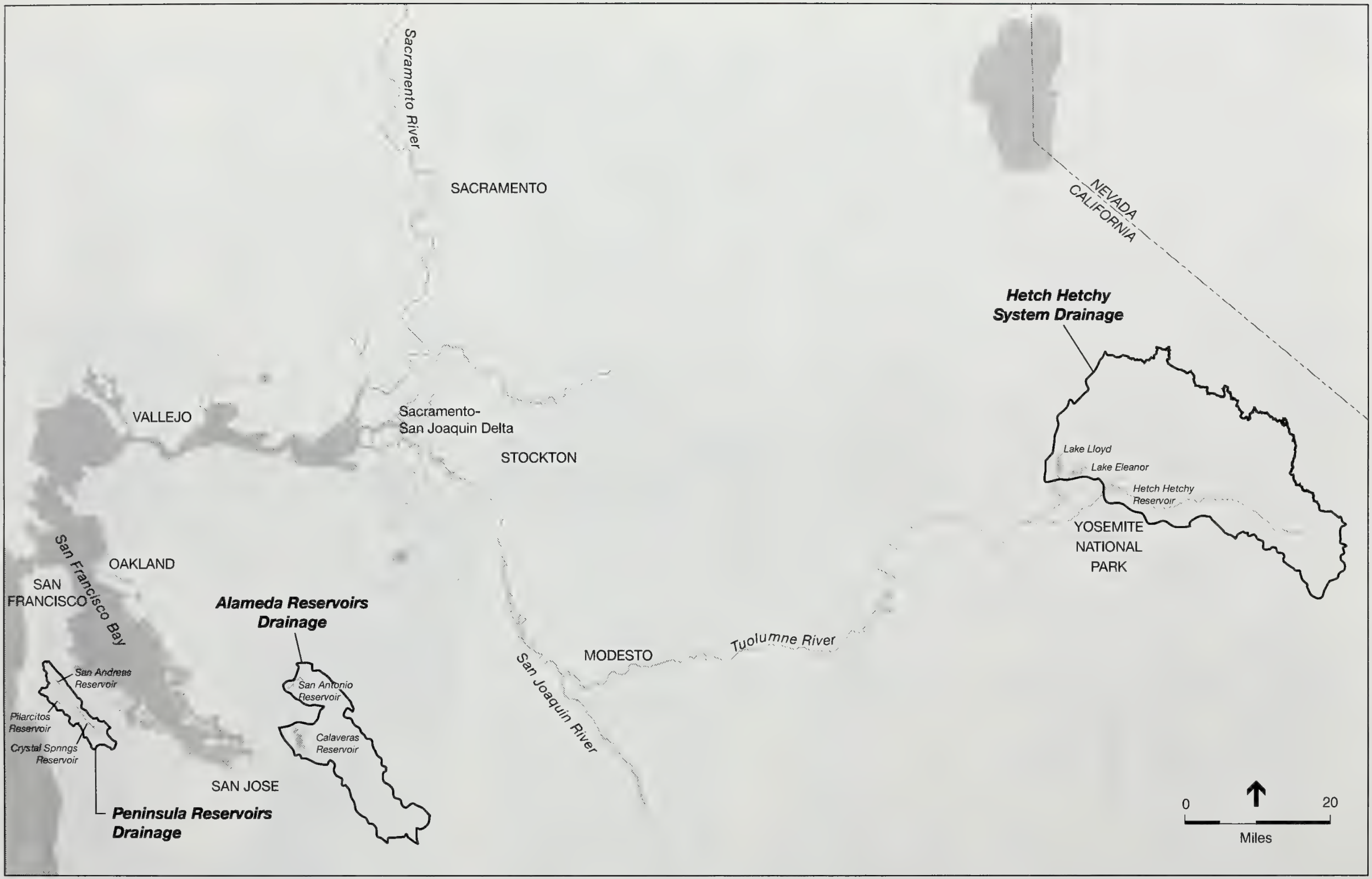
[1] The Cordilleras Mutual Water Association is also a wholesale customer receiving water from the SFPUC, but it is not a BAWSCA member and not shown in Figure 2-3. It is a small water association serving 18 single-family homes located in San Mateo County.



SOURCE San Francisco Planning Department, 2008

SFPUC Lower Crystal Springs Dam Improvements

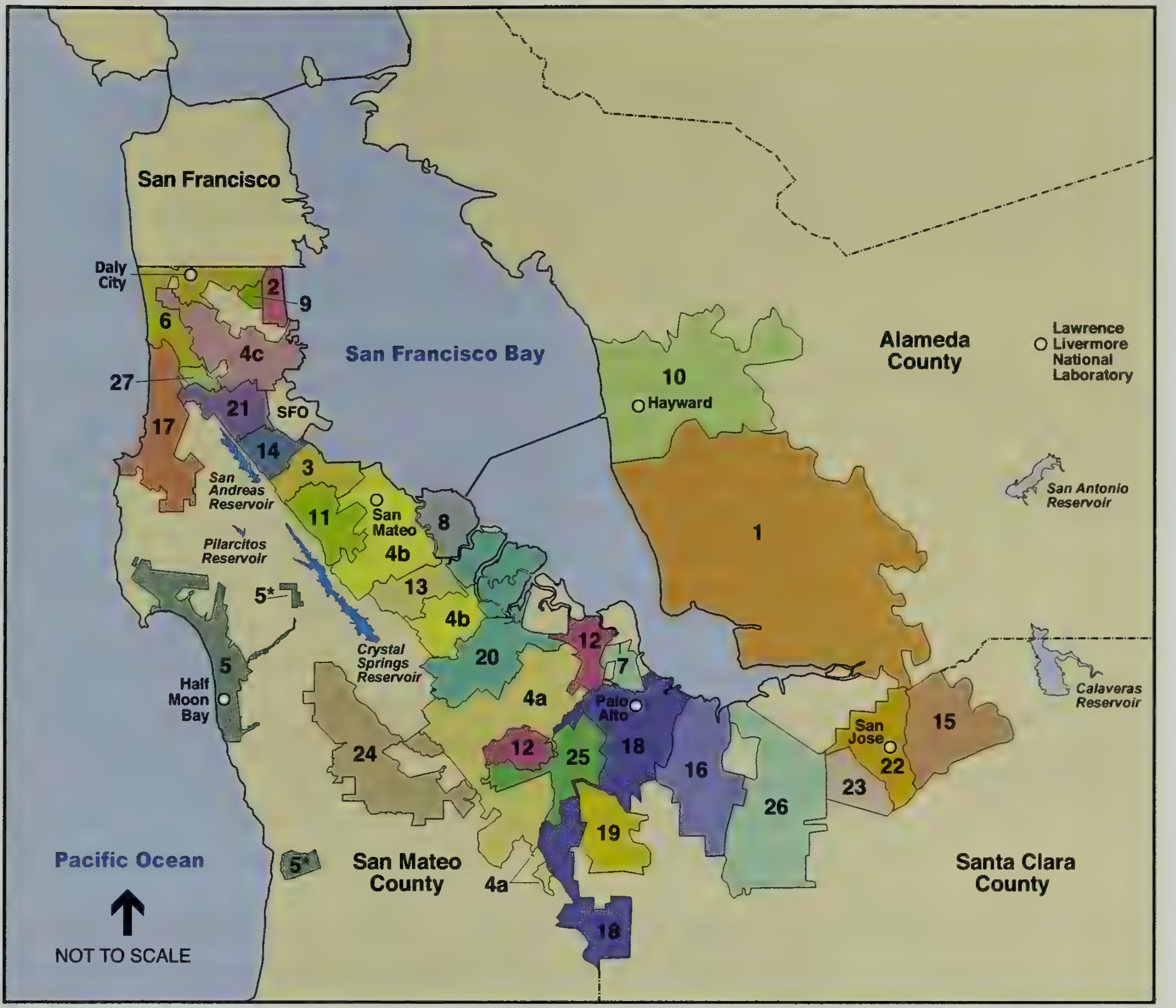
Figure 2-1
SFPUC Regional Water System



SOURCE: San Francisco Planning Department, 2008

SFPUC Lower Crystal Springs Dam Improvements

Figure 2-2
SFPUC Water Supply Watersheds



Legend
(Wholesale customers and members of Bay Area Water Supply and Conservation Agency)

1 Alameda County Water District
2 City of Brisbane
3 City of Burlingame
4a CWS – Bear Gulch
4b CWS – Mid-Peninsula
4c CWS – South San Francisco
5 Coastside County Water District
6 City of Daly City
7 City of East Palo Alto
8 Estero Municipal Improvement District
9 Guadalupe Valley Municipal Improvement District
10 City of Hayward
11 Town of Hillsborough
12 City of Menlo Park
13 Mid-Peninsula Water District
14 City of Millbrae
15 City of Milpitas
16 City of Mountain View
17 North Coast County Water District
18 City of Palo Alto
19 Purissima Hills Water District
20 City of Redwood City
21 City of San Bruno
22 City of San Jose (North)
23 City of Santa Clara
24 Skyline County Water District
25 Stanford University
26 City of Sunnyvale
27 Westborough Water District

* Portions of Coastside County Water District not served by the SFPUC regional water system.

NOTE: For the purposes of this EIR, the California Water Service (CWS) Company is a single wholesale customer with three different water service districts.

SOURCE: BAWSCA, 2006

Figure 2-3
SFPUC Water Service Area -
San Francisco and SFPUC Wholesale Customers

TABLE 2-1
WSIP GOALS AND OBJECTIVES

Program Goal	System Performance Objective
Water Quality – *maintain high-quality water*	• Design improvements to meet current and foreseeable future federal and state water quality requirements. • Provide clean, unfiltered water originating from Hetch Hetchy Reservoir and filtered water from local watersheds. • Continue to implement watershed protection measures.
Seismic Reliability – *reduce vulnerability to earthquakes*	• Design improvements to meet current seismic standards. • Deliver basic service to the three regions in the service area (East/South Bay, Peninsula, and San Francisco) within 24 hours after a major earthquake. Basic service is defined as average winter-month usage, and the performance objective for the regional system is 229 million gallons per day (mgd). The performance objective is to provide delivery to at least 70 percent of the turnouts (i.e., water diversion connecting points from the regional system to customers) in each region, with 104, 44, and 81 mgd delivered to the East/South Bay, Peninsula, and San Francisco regions, respectively. • Restore facilities to meet average-day demand of up to 300 mgd within 30 days after a major earthquake.
Delivery Reliability – *increase delivery reliability and improve the ability to maintain the system*	• Provide operational flexibility to allow planned maintenance shutdown of individual facilities without interrupting customer service. • Provide operational flexibility to minimize the risk of service interruption due to unplanned facility upsets or outages. • Provide operational flexibility and system capacity to replenish local reservoirs as needed. • Meet estimated average annual demand of up to 300 mgd under the conditions of one planned shutdown of a major facility for maintenance concurrent with one unplanned facility outage due to a natural disaster, emergency, or facility failure/upset.
Water Supply – *meet customer water needs in nondrought and drought periods*	• Meet average annual water demand of 265 mgd from the SFPUC watersheds for retail and wholesale customers during nondrought years for system demands through 2018. • Meet dry-year delivery needs through 2018 while limiting rationing to a maximum 20 percent systemwide reduction in water service during extended droughts. • Diversify water supply options during nondrought and drought periods. • Improve use of new water sources and drought management, including groundwater, recycled water, conservation, and transfers.
Sustainability – *enhance sustainability in all system activities*	• Manage natural resources and physical systems to protect watershed ecosystems. • Meet, at a minimum, all current and anticipated legal requirements for the protection of fish and wildlife habitat. • Manage natural resources and physical systems to protect public health and safety.
Cost-effectiveness – *achieve a cost-effective, fully operational system*	• Ensure cost-effective use of funds. • Maintain gravity-driven system. • Implement regular inspection and maintenance program for all facilities.

SOURCE: SFPUC Resolution No. 08-0200.

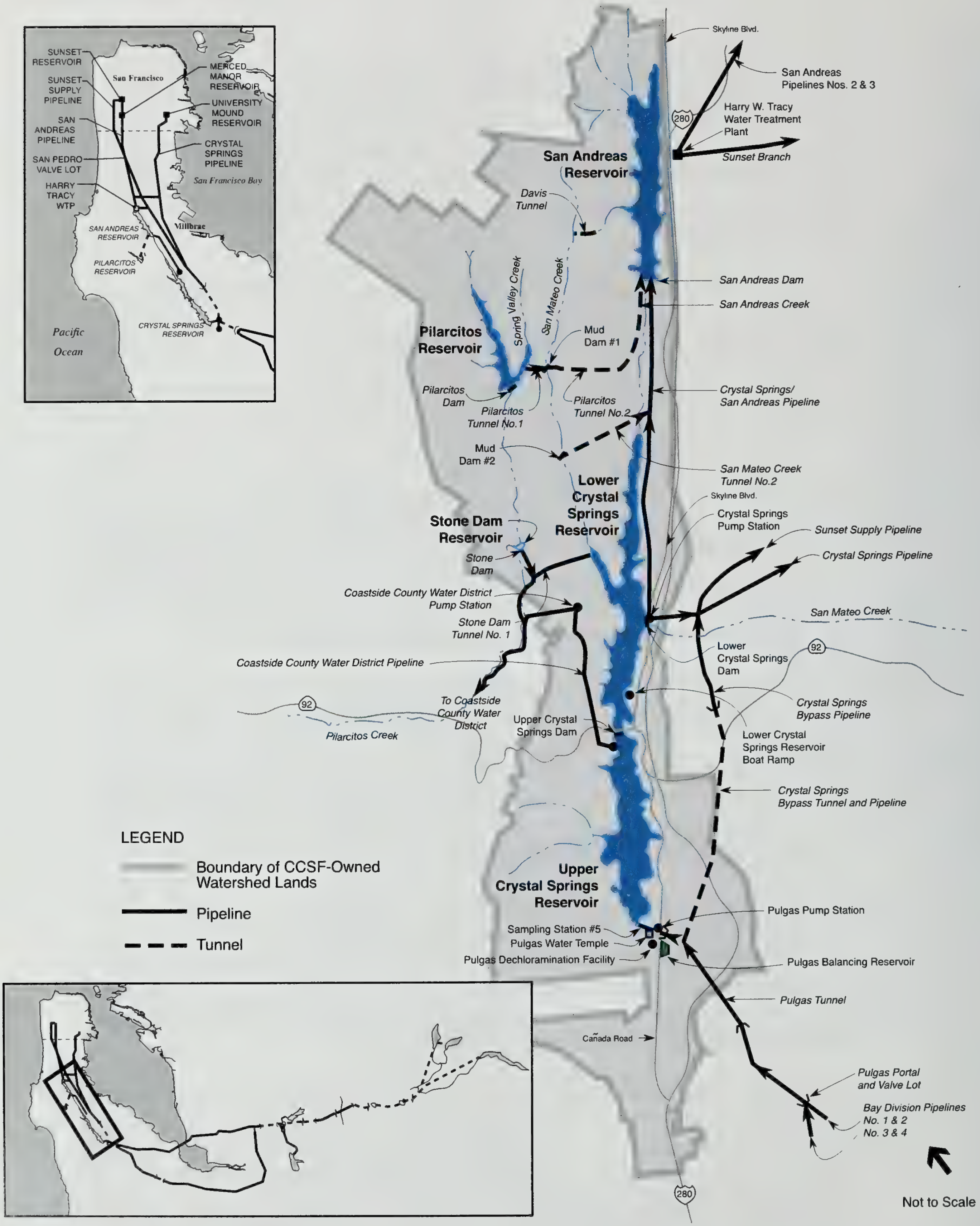
The San Francisco Planning Department prepared a Program Environmental Impact Report (PEIR) to address the potential environmental impacts of the WSIP. The San Francisco Planning Commission certified the WSIP PEIR on October 30, 2008 (San Francisco Planning Department, 2008; San Francisco Planning Commission Motion No. 17734). The SFPUC approved the WSIP and made CEQA Findings, including a statement of overriding considerations and adoption of a mitigation monitoring and reporting program for the WSIP. The WSIP PEIR is described below in Section 2.3, Purpose of this EIR.

2.2.3 Regional Water System Facilities – Peninsula Watershed

The proposed project is located along the SFPUC's regional water system in the Peninsula watershed in San Mateo County. The Peninsula watershed encompasses 23,000 acres of CCSF-owned lands that are operated and managed by the SFPUC. It includes large portions of the natural drainage areas of San Mateo, Pilarcitos, and San Andreas Creeks and contains vast acreages of natural communities, including coniferous and oak forest, scrub and chaparral, freshwater marsh and wetlands, and grasslands habitats. Water system facilities in the Peninsula watershed, shown in **Figure 2-4**, transport water supplies from the Tuolumne River and Alameda Creek watersheds to local storage reservoirs as well as directly to retail and wholesale customers in San Mateo and San Francisco Counties. The Peninsula watershed also contributes local surface water supplies that are captured and stored in the Crystal Springs, Pilarcitos, and San Andreas reservoirs. The proposed project involves improvements to the LCSD, which forms Crystal Springs Reservoir, one of the local reservoirs serving the regional water system.

Crystal Springs Reservoir is where water from the Tuolumne River and Alameda Creek watershed blend with local water from the Peninsula watershed. Tuolumne River water supplies combined with treated Alameda Creek watershed supplies are conveyed to Crystal Springs Reservoir via the Hetch Hetchy Aqueduct, with flows regulated as necessary to serve customer demand and to achieve reservoir operation objectives. Prior to discharge to Crystal Springs Reservoir, the water is treated to meet regulatory discharge requirements and to protect the water quality in the reservoir. Crystal Springs Reservoir was originally constructed as two separate reservoirs: Upper and Lower Crystal Springs Reservoirs. As constructed, Upper Crystal Springs Dam, built in 1877, formed the upper (southern) reservoir, and the LCSD, built in 1890 on San Mateo Creek, formed the lower (northern) reservoir. Two culverts cross through the Upper Crystal Springs Dam. The upper culvert was built in 1924, and the lower culvert was built in the late 1800s. Since 1924, both culverts have enabled unregulated flow between the reservoirs, and the two reservoirs are now operated as a single unit. In 1924, San Mateo County built a bridge, known as the Crystal Springs Dam Bridge or the Skyline Boulevard Bridge, over the crest of the LCSD.

The Crystal Springs Pump Station pumps water stored in Crystal Springs Reservoir through the Crystal Springs/San Andreas Pipeline to San Andreas Reservoir. San Andreas Reservoir also receives water from Pilarcitos Reservoir, but its primary source of water is Crystal Springs Reservoir. Water from San Andreas Reservoir is treated at the Harry Tracy Water Treatment Plant, which provides filtration, fluoridation, and disinfection for water collected in all of the Peninsula reservoirs before transmission to the regional system and delivery to customers in northern San Mateo County and San Francisco.


SUNSET RESERVOIR
SUNSET SUPPLY PIPELINE
SAN ANDREAS PIPELINE
SAN PEDRO VALVE LOT
HARRY TRACY WTP
San Francisco
MERCED MANOR RESERVOIR
UNIVERSITY MOUND RESERVOIR
CRYSTAL SPRINGS PIPELINE
San Francisco Bay
Millbrae
SAN ANDREAS RESERVOIR
PILARCITOS RESERVOIR
CRYSTAL SPRINGS RESERVOIR
Pacific Ocean
Skyline Blvd.
San Andreas Pipelines Nos. 2 & 3
280
Harry W. Tracy Water Treatment Plant
Sunset Branch
San Andreas Reservoir
Davis Tunnel
Spring Valley Creek
San Mateo Creek
San Andreas Dam
San Andreas Creek
Pilarcitos Reservoir
Mud Dam #1
Pilarcitos Dam
Pilarcitos Tunnel No.1
Pilarcitos Tunnel No.2
Crystal Springs/ San Andreas Pipeline
Mud Dam #2
San Mateo Creek Tunnel No.2
Lower Crystal Springs Reservoir
Skyline Blvd.
Crystal Springs Pump Station
Sunset Supply Pipeline
Crystal Springs Pipeline
Stone Dam Reservoir
Stone Dam
Coastside County Water District Pump Station
Stone Dam Tunnel No. 1
San Mateo Creek
Lower Crystal Springs Dam
92
Coastside County Water District Pipeline
To Coastside County Water District
92
Pilarcitos Creek
Upper Crystal Springs Dam
Crystal Springs Bypass Pipeline
Lower Crystal Springs Reservoir Boat Ramp
Crystal Springs Bypass Tunnel and Pipeline
LEGEND
Boundary of CCSF-Owned Watershed Lands
Pipeline
Tunnel
Upper Crystal Springs Reservoir
Pulgas Pump Station
Sampling Station #5
Pulgas Water Temple
Pulgas Dechloramination Facility
Pulgas Balancing Reservoir
Pulgas Tunnel
Cañada Road
Pulgas Portal and Valve Lot
Bay Division Pipelines No. 1 & 2 No. 3 & 4
280
Not to Scale

SOURCE: San Francisco Planning Department, 2001

SFPUC Lower Crystal Springs Dam Improvements

Figure 2-4
Peninsula Watershed Facilities

2.3 Purpose of this EIR

The San Francisco Planning Department is the lead agency responsible for the implementation of CEQA requirements for the CCSF, including environmental review of projects sponsored by the SFPUC. The San Francisco Planning Department, Major Environmental Analysis Division has prepared this EIR on the SFPUC's LCSDI project. This document tiers from the WSIP PEIR, as provided for under CEQA,[2] and presents the project-specific analysis of potential environmental impacts of the proposed project.

This EIR has been prepared in compliance with CEQA (California Public Resources Code, Sections 21000 et seq.), the CEQA Guidelines, and Chapter 31 of the CCSF Administrative Code. CEQA requires the preparation of an EIR when a project could significantly affect the physical environment. This EIR includes a description of the project and the environmental setting, identifies potential physical environmental impacts associated with project construction and operation, lists mitigation measures for impacts found to be significant, identifies environmental impacts determined to be significant and unavoidable, and compares and evaluates a reasonable range of project alternatives. This EIR is an informational document that does not, in and of itself, determine whether a project will be approved; rather, it is intended to aid the planning and decision-making process by disclosing the physical environmental effects of the project and identifying possible ways of reducing or avoiding its potentially significant impacts.

This EIR is a project-level environmental review document that tiers from the program-level analysis presented in the WSIP PEIR (San Francisco Planning Department, 2008). The WSIP PEIR is available to the public at the San Francisco Planning Department, 1660 Mission Street, 4th Floor, San Francisco, California. The portions of the environmental impact analysis of the WSIP that are relevant to the proposed project are incorporated by reference into this EIR.

The WSIP PEIR contains: (1) a project-level evaluation of the environmental impacts of the WSIP water supply strategy and systemwide operations, and (2) a program-level evaluation of the environmental impacts of the WSIP facility improvement projects. All of the WSIP's project-level impacts related to water supply strategy and systemwide operations, to which the LCSDI project would contribute, have been examined at a sufficient level of detail in the PEIR that no further analysis is required. For identified impacts due to proposed WSIP water supply and systemwide operations, the PEIR included mitigation measures that would avoid or lessen the severity of the impacts, or the SFPUC made revisions to the WSIP prior to program approval that would avoid or mitigate those impacts. All of the WSIP's program-level impacts related to the proposed project as one of the WSIP facility improvement projects are re-examined in this document in light of more detailed project information.

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[2] CEQA Guidelines Section 15152 states that "'Tiering' refers to using the analysis of general matters contained in a broader EIR ... with later EIRs ... on narrower projects; incorporating by reference the general discussions from the broader EIR; and concentrating the later EIR ... solely on the issues specific to the later project."

2.4 CEQA Process and Public Outreach

2.4.1 Environmental Evaluation Application and Notice of Preparation

On April 24, 2006, the SFPUC filed for an Environmental Evaluation Application with the San Francisco Planning Department, as required by Chapter 31 of the CCSF Administrative Code. Based on this application, the Planning Department determined that preparation of an EIR was required for the proposed project to satisfy the requirements of CEQA.

In accordance with Sections 15063 and 15082 of the CEQA Guidelines, the San Francisco Planning Department, as lead agency, sent a Notice of Preparation (NOP) to approximately 1,450 elected officials, public agencies, and interested groups and individuals to inform them that an EIR would be prepared on the proposed project and to begin the formal CEQA scoping process. A copy of the NOP is included in **Appendix A**. The scoping period began on January 2, 2007 with the issuance of the NOP, and the Planning Department accepted written comments through the end of the comment period on February 1, 2007. The NOP included a description of the project along with a preliminary discussion of its potential environmental impacts in the following resource areas: aesthetics; biological resources; cultural resources; hydrology and water quality; land use and zoning; noise and vibration; and traffic and circulation. The NOP and other information related to the project were posted on the San Francisco Planning Department's website (http://www.sf-planning.org). As additional notification, legal notices were placed in the *San Francisco Chronicle* on January 2, 2007 and the *San Mateo County Times* on January 5, 2007. Display ads were also placed in the *San Mateo County Times* on January 10, 2007.

2.4.2 Public and Interagency Scoping Meetings

The San Francisco Planning Department held a public scoping meeting at the South Hillsborough School in Hillsborough, California on January 18, 2007, approximately two weeks after distribution of the NOP. The purpose of the meeting was to solicit public input regarding project-related issues and the scope of the EIR analysis. Attendees were afforded the opportunity to voice comments or concerns on the project's potential effects and to identify issues to be covered in the EIR. Meeting proceedings were documented electronically, audio recorded, and transcribed by a court reporter to make a verbatim written transcript of the meeting.

In addition to the public scoping meeting and the public comment period, an interagency meeting was held on April 3, 2007 by the San Francisco Planning Department to receive comments directly from state and federal agencies. Representatives of the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, and California Department of Fish and Game attended the meeting. The Planning Department provided the agency representatives with an abbreviated version of the presentation given at the public scoping meeting, and project issues raised by the attending agencies were discussed.

2.4.3 Public and Agency Comments on NOP

The scoping process provided an opportunity for the public and agencies to submit written and verbal comments on the issues and scope of the EIR; all comments received during the scoping period are provided in **Appendix B**, including transcripts of the scoping meeting. In addition to public and agency input at the scoping meeting, the San Francisco Planning Department received nine scoping comments in the form of letters and email and one comment via telephone. The major environmental concerns raised during the scoping period are summarized by topic and resource area in **Table 2-2**, which also references the sections of this EIR where the comments are addressed.

TABLE 2-2
SUMMARY OF SCOPING COMMENTS

Summary of Comments	Addressed in the EIR
Project Description	
• The EIR should explain how the increased storage is linked to other WSIP projects. If the LCSDI project is not implemented, how would this affect the WSIP level of service goals?	Chapter 3, Project Description, and Chapter 8, Alternatives
• The EIR should explain how the proposed project would improve the seismic performance of the dam, and whether the project would affect the probability of catastrophic flooding associated large seismic events.	
• The EIR should describe how the removal of PG&E's temporary overhead power lines and poles are related to the LCSDI project.	
Plans and Policies	
• The EIR should address consistency with the Golden Gate National Recreation Area Scenic and Recreational Easements.	Chapter 4, Plans and Policies
Aesthetics	
• The EIR should consider potential alterations to Skyline Boulevard, the LCSD, and the Sawyer Camp Trail with respect to visual resources.	Section 5.3, Aesthetics
Cultural Resources	Section 5.5, Cultural and Paleontological Resources
• The EIR should address impacts on cultural resources, including impacts associated with the character and setting of Skyline Boulevard and the LCSD.	
Recreation	
• The EIR should describe potential impacts on recreational use of the Sawyer Camp Trail and include provisions to maintain pedestrian access along the trail during construction.	Section 5.10, Recreation
Biological Resources	
• The EIR should include a complete description and map of vegetation communities, wildlife habitats, creeks, wetlands, and other important habitat features on site, including endangered, threatened, and locally unique species and sensitive habitats.	Section 5.13, Biological Resources; Section 5.15, Hydrology and Water Quality; and Section 3.9, Required Permits and Approvals
• The EIR should provide a detailed evaluation of animal and vegetative communities potentially inundated and/or adversely affected by the planned changes in reservoir elevations.	
• The EIR should discuss how the SFPUC will avoid impacts on fully protected species such as San Francisco garter snake. The EIR must incorporate mitigation measures for all state and federal special-status species present within the project area.	

TABLE 2-2 (Continued)
SUMMARY OF SCOPING COMMENTS

Summary of Comments	Addressed in the EIR
Biological Resources (cont.)	
• The EIR should discuss how the project would alter the natural streamflow conditions of San Mateo Creek and subsequently affect fish populations. Specifically, the EIR should discuss how the proposed improvements comply with Section 5937 of the Fish and Game Code. • The project could require a Streambed Alteration Agreement pursuant to Section 1600 of the Fish and Game Code.	
Hydrology and Water Quality	
• The project could be subject to Waste Discharge Requirements if the project would result in a discharge of pollutants to waters of the state. • The project would be subject to the requirements of the National Pollutant Discharge Elimination System General Construction Activities Permit. • The project should incorporate innovative site designs that reduce impervious surfaces. • The EIR should address whether changes in reservoir operations would affect the City of San Mateo's Federal Emergency Management Agency flood hazard map revision process. • The EIR should address how the proposed project would alter the natural streamflow conditions of San Mateo Creek. • The EIR should investigate the use of bioengineering techniques for erosion control.	Section 5.15, Hydrology and Water Quality
Population and Growth	
• The EIR's discussion of growth-inducing effects must be consistent with the WSIP PEIR.	Section 7.1, Growth-Inducing Impacts
Cumulative Impacts	
• The EIR's discussion of cumulative effects must be consistent with the WSIP PEIR.	Chapter 5, Environmental Setting, Impacts, and Mitigation Measures; Section 7.2, Summary of Cumulative Impacts

2.4.4 Draft EIR Public Review

This Draft EIR is being circulated to local, state, and federal agencies and to interested organizations and individuals that may wish to review and comment on the document. Publication of this Draft EIR marks the beginning of a 45-day public review period, during which time the San Francisco Planning Department will accept comments on the Draft EIR. During this 45-day review period, the San Francisco Planning Department will also conduct two public hearings to receive oral comments on the Draft EIR, one in San Mateo County and one before the San Francisco Planning Commission. In addition, a public hearing on the Draft EIR will be held before the San Francisco Historic Preservation Commission.

Public comments on the Draft EIR will be accepted from March 2, 2010 to April 16, 2010. Public hearings on the Draft EIR to accept written or oral comments are scheduled as follows:

Hillsborough Town Hall
1600 Floribunda Avenue
Hillsborough, CA
April 6, 2010, 6:30 p.m.

San Francisco Historic Preservation Commission
San Francisco City Hall, Room 400
1 Dr. Carton B. Goodlett Place
San Francisco, CA
April 7, 2010, 2:30 p.m.

San Francisco Planning Commission
San Francisco City Hall, Room 400
1 Dr. Carton B. Goodlett Place
San Francisco, CA
April 8, 2010, 1:30 p.m. or later (call 415-558-6422 the week of the hearing for a recorded message giving a more specific time)

Copies of the Draft EIR and related key documents are available at the following locations:

San Francisco Planning Department
1660 Mission Street, 1st Floor
Planning Information Counter
San Francisco, CA

San Francisco Main Library
100 Larkin Street
San Francisco, CA

San Mateo Main Public Library
55 West 3rd Avenue
San Mateo, CA

The Draft EIR can also be accessed through the internet at the following address:

http://mea.sfplanning.org

2.4.5 Comments and Responses Document and Final EIR

The San Francisco Planning Department will review all written and oral comments received on the Draft EIR and will prepare written responses to them in a Comments and Responses document. The Comments and Responses document will be distributed to all entities that submit comments on the EIR as well as to those decision-makers with authority over the EIR and the proposed project. The Comments and Responses document, together with this Draft EIR, will constitute the Final EIR.

2.4.6 Mitigation Monitoring and Reporting

State law requires lead agencies to adopt a mitigation monitoring and reporting program (MMRP) for any mitigation measures that were adopted or made conditions of project approval in order to mitigate or avoid significant effects on the environment. The CEQA Guidelines do not require inclusion of the MMRP in the EIR. Throughout this EIR, however, proposed mitigation measures have been clearly identified and presented in language that will facilitate establishment of an MMRP. If the SFPUC decides to approve the proposed project or take alternative action based upon this EIR, then CEQA requires the SFPUC to make formal environmental findings and adopt an MMRP based on the mitigation measures identified in this EIR.

2.5 Organization of this EIR

This EIR is organized into nine chapters, as follows:

- **Chapter 1, Summary.** This chapter presents a summary of the proposed project, identifies potentially significant environmental impacts and mitigation measures, and describes the alternatives considered in this EIR. It also identifies areas of controversy and issues to be resolved.

- **Chapter 2, Introduction and Background.** This chapter provides project background information and describes the purpose and organization of the EIR, as well as the environmental review process.

- **Chapter 3, Project Description.** This chapter describes the proposed project, including project objectives, a summary of project components, and information about project construction and proposed operations. The chapter also lists required permits and approvals.

- **Chapter 4, Plans and Policies.** This chapter describes land use plans and policies and the manner in which they are relevant to the LCSDI project, and then discusses the project's consistency with those plans.

- **Chapter 5, Environmental Setting, Impacts, and Mitigation Measures.** This chapter is subdivided into sections for each environmental resource topic. Each section describes the environmental and regulatory setting, significance criteria, and approach to the analysis for that resource topic. It then presents an analysis of potential environmental impacts and the project-specific mitigation measures that have been developed to address significant and potentially significant impacts. Each section also includes an evaluation of cumulative impacts with respect to that resource topic.

- **Chapter 6, Mitigation Measures.** This chapter presents the project-specific mitigation measures that were identified to address significant and potentially significant impacts.

- **Chapter 7, Other CEQA Issues.** This chapter discusses growth-inducing effects, summarizes the cumulative impacts, identifies the significant environmental effects that cannot be avoided if the proposed project is implemented, and significant irreversible changes.

- **Chapter 8, Alternatives.** This chapter describes the alternatives to the proposed project and compares their impacts to those of the proposed project. This chapter also summarizes the alternatives that were considered but rejected from further analysis.
- **Chapter 9, EIR Authors and Consultants.** This chapter lists the authors of and contributors to this EIR.
- **Appendices A through M**. Thirteen appendices provide information in support of the information presented in the above chapters, including several background technical studies prepared for the project.

2.6 References

San Francisco Planning Department, *Final Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program*, File No. 2005.0159E, State Clearinghouse No. 2005092026. Certified October 30, 2008.

San Francisco Public Utilities Commission (SFPUC), SFPUC Resolution 08-200, Water System Improvement Program California Environmental Quality Act Findings: Findings of Fact, Evaluation of Mitigation Measures and Alternatives, and Statement of Overriding Considerations, October 2008.

CHAPTER 3

Project Description

Sections

3.1 Introduction and Summary
3.2 Project Location
3.3 Project Goals and Objectives
3.4 Existing Facilities and Current Operations at Lower Crystal Springs Dam
3.5 Project Components
3.6 Project Construction
3.7 Operations and Maintenance of Lower Crystal Springs Dam and Crystal Springs Reservoir
3.8 Coordination with Other Local Projects
3.9 Required Permits and Approvals
3.10 References

Tables

3-1 Staging and Storage Areas
3-2 Construction Equipment Likely to Be Used

Figures

3-1 Project Location
3-2 Lower Crystal Springs Dam, Existing Conditions
3-3 Proposed Modifications to Lower Crystal Springs Dam, Plan View
3-4 Photograph of Upstream Face of Lower Crystal Springs Dam, Facing South
3-5 Photograph of Downstream Face of Lower Crystal Springs Dam, Facing South
3-6 Proposed Spillway Modifications, Cross-section
3-7 Proposed Stilling Basin Modifications, Plan and Cross-section Views
3-8 Staging and Storage Areas in the LCSD Vicinity
3-9a Staging and Storage Areas in the LCSD Vicinity—Aerial Base
3-9b Staging and Storage Areas in the LCSD Vicinity—Aerial Base
3-10 Staging and Storage Areas in Sampling Station #5 Vicinity
3-11 Staging and Storage Areas in Sampling Station #5 Vicinity—Aerial Base
3-12 Other Projects in the Immediate Vicinity of Lower Crystal Springs Dam

3.1 Introduction and Summary

San Francisco's regional water system serves approximately 2.4 million people, almost all of whom live in the San Francisco Bay Area. The system obtains about 85 percent of its water from the Tuolumne River in the Sierra Nevada, with the remainder originating from watersheds in Alameda, Santa Clara, and San Mateo Counties. The San Francisco Public Utilities Commission (SFPUC) conveys water from Hetch Hetchy Reservoir in Yosemite National Park directly to customers and to three local reservoirs in the Bay Area. Crystal Springs Reservoir, located 12 miles south of San Francisco, is one of the local reservoirs serving the regional water system.

Crystal Springs Reservoir is formed by Lower Crystal Springs Dam (LCSD). The California Department of Water Resources, Division of Safety of Dams (DSOD), is responsible for regulating all dams in California. In 1983, the DSOD restricted the amount of water the SFPUC could store in Crystal Springs Reservoir because of concerns that the dam could be overtopped, and subsequently be damaged and/or even fail, during the Probable Maximum Flood (PMF). The PMF is the theoretical flood event predicted to occur under the most severe and extreme combination of meteorological and hydrological conditions in a particular drainage area, and the DSOD includes the PMF as part of its design requirements to ensure the safety of the LCSD. Although the PMF has a very low probability of occurrence, design for the PMF event is mandated by the DSOD as a "fail safe" design for lesser flood events.

The SFPUC is proposing to implement the Lower Crystal Springs Dam Improvements project (LCSDI or proposed project) to lift the DSOD-imposed restriction and to restore the historical storage capacity of Crystal Springs Reservoir. The proposed improvements would enable floodwater associated with the PMF and other very large and infrequent floods to pass safely over the LCSD. The dam spillway would be widened, its crest reshaped and permanently raised, the parapet wall raised, and a new stilling basin built at the toe of the dam to replace the existing stilling basin. In addition, as an ancillary project component, a water quality sampling station located at the Pulgas Discharge Channel (Sampling Station #5) would be raised to accommodate the proposed changes in reservoir operations once the dam improvements are completed.

The proposed project has a 14-month construction schedule, but the majority of the construction would be completed in 9 months, including periods with 24-hour-per-day construction. The remaining 5 months would be needed for startup and completion activities and would provide a contingency period for minor repairs and inspections if needed. Between 20 and 45 construction workers would be employed at the LCSD site (the exact number at any time depending on the activities in progress), and 2 to 10 workers would be employed at the sampling station site. After the proposed project is completed, the SFPUC would operate Crystal Springs Reservoir in much the same way as it does under existing conditions, except that the maximum normal water surface elevation would be 4 feet above its current level of 283.8 feet NGVD 29.[1]

3.2 Project Location

Lower Crystal Springs Dam is located on San Mateo Creek in unincorporated San Mateo County, California, as shown in **Figure 3-1**, about 12 miles south of San Francisco and 3 miles west of the city of San Mateo. The dam forms Crystal Springs Reservoir, which lies west of Interstate 280 (I-280) and has a surface area of about 1,300 acres when the water levels are at an elevation of 283.8 feet. The lands underlying the LCSD and Crystal Springs Reservoir and most of the lands draining to the reservoir are owned by the City and County of San Francisco as part of the Peninsula watershed. An ancillary component of the proposed project would be implemented at the water quality

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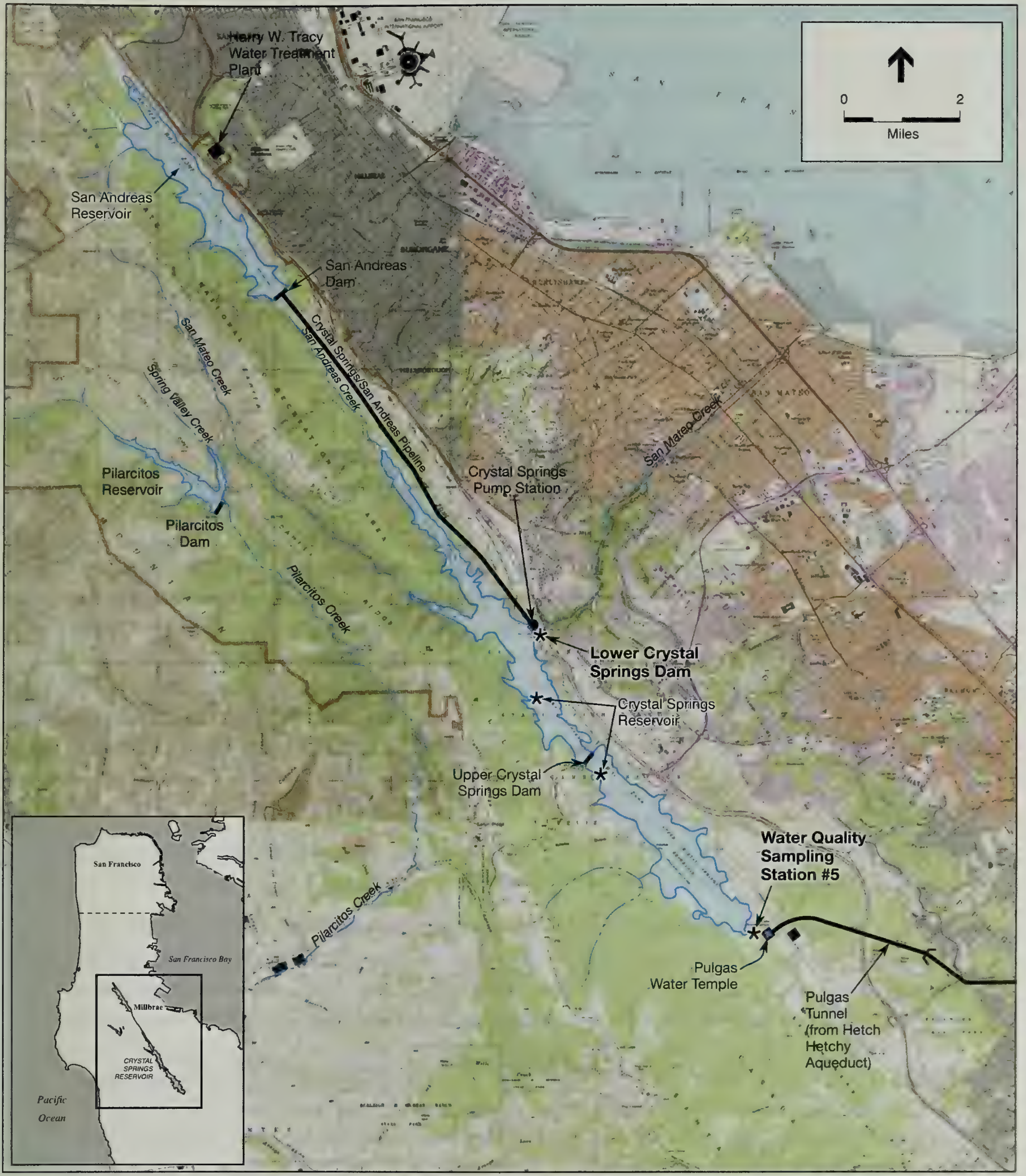
[1] All elevations used in this report are referenced with respect to the National Geodetic Vertical Datum of 1929 (NGVD or NGVD 29).



SOURCE: ESA + Orion, 2009; USGS, 1978.

SFPUC Lower Crystal Springs Dam Improvements

Figure 3-1
Project Location

sampling station located at the Pulgas Discharge Channel, which is approximately 4 miles south of the LCSD and also within the Peninsula watershed (see Figure 3-1).

Regional access to the project area is provided by I-280 and Highway 92. Skyline Boulevard (Highway 35) and Crystal Springs Road provide local access to the LCSD site. Skyline Boulevard, a county road, crosses over the LCSD at the Skyline Boulevard Bridge (also known as the Crystal Springs Dam Bridge), where it is supported by piers built into the dam. Crystal Springs Road, another county road, joins Skyline Boulevard from the east, several hundred feet north of the dam. A road owned by the SFPUC extends from Crystal Springs Road to the base of the LCSD and provides access to the toe of the dam, the stilling basin, and other SFPUC regional water system facilities, including the Crystal Springs Pump Station. Cañada Road provides local access to the sampling station site.

3.3 Project Goals and Objectives

3.3.1 WSIP Goals and Objectives

As described in Chapter 2, Introduction and Background, the proposed project is part of the SFPUC's Water System Improvement Program (WSIP). With the exception of the water supply goal, the WSIP goals and objectives (shown in Table 2-1 in Chapter 2, Introduction and Background) are based on a planning horizon through 2030. The water supply goal is based on a planning horizon through 2018. The overall WSIP goals for the regional water system are to:

- Maintain high-quality water
- Reduce vulnerability to earthquakes
- Increase water delivery reliability
- Meet customer water supply needs
- Enhance sustainability
- Achieve a cost-effective, fully operational system

The size and design of the individual WSIP facility improvement projects are driven by the WSIP's system performance objectives and would not change as a result of the WSIP's water supply strategy. The originally proposed WSIP included multiple program goals for improving seismic reliability and water delivery reliability, meeting current and future water quality regulations, and meeting water supply reliability goals. Design and capacity of the WSIP facility improvement projects is driven by all four of the WSIP objectives -- the need to improve system performance for seismic reliability and water delivery reliability as well as maintaining high water quality standards and meeting water supply goals. All four of these objectives are factored into the decision on how to size the WSIP's individual facilities. Even if the goal of meeting projected increases in water supply demands were dropped from the mix of program objectives, the other program goals would cause the SFPUC to design WSIP facility improvement projects of the same size. All the WSIP facilities are sized to reliably deliver an average annual amount of 265 mgd (and up to 300 mgd) in light of the regional system's needs for seismic and delivery reliability during both drought and non-drought periods, and to meet water quality requirements (SFPUC Resolution No. 08-0200).

3.3.2 LCSDI Goals and Objectives

As one of the key regional facility improvement projects under the WSIP, the LCSDI would support the WSIP goals and objectives related to systemwide seismic reliability, delivery reliability, and water supply reliability for the regional water system. Specifically, the primary goal of the proposed project is to comply with the DSOD requirement that the dam be able to accommodate the PMF (DSOD, 1983, 1985). The PMF is the theoretically largest flood that can be reasonably expected to occur at the dam as a result of runoff from the upstream watershed.[2] To comply with the DSOD requirement, floodwater from the PMF must be able to pass over the dam to the stream below without endangering the dam's structural integrity. In 1983, the DSOD determined that the LCSD cannot sustain the PMF without floodwaters overtopping the dam and possibly damaging the structure. The DSOD required that the SFPUC take one of three actions:

- Demonstrate that the dam as it currently exists can safely pass the PMF;
- Construct hydraulic improvements that would enable the dam to safely pass the PMF; or
- Adopt further restrictive operating procedures that would enable the dam (as it currently exists) to safely pass the PMF.

Until one of these actions is taken, the DSOD requires that the SFPUC limit the maximum normal water surface elevation in Crystal Springs Reservoir to 283.8 feet. This operating level is equivalent to 18.5 billion gallons of water storage, and represents a 16 percent reduction in the reservoir's storage capacity. Before the limitation was imposed, the DSOD had approved an operating surface elevation of 291.8 feet, which is equivalent to 22.15 billion gallons of storage capacity. The SFPUC is currently operating the LCSD and Crystal Springs Reservoir in compliance with the DSOD's interim restrictions.

The objectives of the LCSDI project are to:

- Complete modifications to the existing LCSD facilities in compliance with the DSOD directive
- Restore the historical storage capacity of Crystal Springs Reservoir
- Improve the SFPUC's water supply delivery capability
- Help meet the SFPUC's dry-year delivery needs
- Facilitate planned shutdown of individual facilities for regular maintenance without interrupting customer service
- Maximize capture of local runoff from the Peninsula watershed
- Increase water storage on the Peninsula

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[2] The PMF is calculated using estimates of the Probable Maximum Precipitation contained in *Probable Maximum Precipitation for California — Hydrometeorological Report No. 58 and 59,* National Oceanic and Atmospheric Administration, 1998 and 1999.

These LCSDI project objectives relate directly to the following WSIP goals and objectives (see Chapter 2, Table 2-1, SFPUC Resolution No. 08-200):

- *Seismic Reliability*. Deliver basic service to the three regions in the service area within 24 hours after a major earthquake and restore facilities to meet average-day demand within 30 days after a major earthquake.

- *Delivery Reliability*. Provide operational flexibility to allow planned maintenance shutdown of individual facilities without interrupting customer service; provide operational flexibility to minimize the risk of service interruption from unplanned facility upsets or outages; provide operational flexibility and system capacity to replenish local reservoirs as needed; meet the estimated average annual demand under the conditions of one planned shutdown of a major facility for maintenance concurrent with one unplanned facility outage.

- *Water Supply Reliability*. Meet dry-year delivery needs while limiting rationing to a maximum 20 percent systemwide reduction in water service during extended droughts.

The proposed improvements would permanently raise the level of the spillway to the historical maximum level, and implementation of the project would allow the SFPUC to increase the average and maximum water surface elevations in Crystal Springs Reservoir, thereby increasing water supply storage over existing conditions. This increase in local storage on the Peninsula would improve the SFPUC's ability to deliver water to its customers, particularly those in San Francisco and San Mateo Counties, during both drought and nondrought periods.

Implementation of the proposed project is a fundamental component needed to achieve the established WSIP system performance objectives for seismic reliability, delivery reliability, and water supply reliability listed above. The WSIP system objectives address the needs of the regional water supply system as a whole, and the LCSDI project, in combination with other facility improvement projects identified in the WSIP, is needed to fully meet these WSIP goals and objectives. The proposed project was designed to incorporate the minimum performance standards for Crystal Springs Reservoir required to achieve the WSIP systemwide level of service objectives.

3.4 Existing Facilities and Current Operations at Lower Crystal Springs Dam

3.4.1 History

Development of water supply facilities in the San Mateo Creek watershed began during the 19th century. During the 1870s, San Andreas Dam was built in the upper reaches of San Andreas Creek, a southward-flowing tributary of San Mateo Creek, and Upper Crystal Springs Dam was built on Laguna Creek, a northward-flowing tributary. The two dams formed San Andreas and Upper Crystal Springs Reservoirs, respectively. Started in 1887 and completed in 1890, LCSD was built on San Mateo Creek downstream of its confluences with San Andreas and Laguna Creeks. The dam formed Lower Crystal Springs Reservoir, the waters of which extended to the downstream face of Upper Crystal Springs Dam. In 1911, a parapet wall was added, raising the crest of LCSD but leaving the spillway elevation unchanged. In 1923, a two-lane highway was constructed across the crest of the dam on concrete bents and at an elevation of 20 feet above the dam crest (SFPUC, 2007a).

Two culverts pass through Upper Crystal Springs Dam; the upper culvert was built in 1924 and the lower culvert was built in the late 1800s. Both culverts hydraulically link Upper and Lower Crystal Springs Reservoirs. Since 1924, the two water bodies have operated as a single reservoir; this document refers to the upper and lower reservoirs collectively as Crystal Springs Reservoir in the context of reservoir operations.

As described above, the safety of dams in California is under the jurisdiction of the DSOD, which visually inspects the LCSD annually and conducted a seismic evaluation of the dam in 2007. Although in proximity to the San Andreas fault, the LCSD has withstood both the 1906 and the lesser 1989 (Loma Prieta) earthquakes without damage (SFPUC, 2009a). Furthermore, the most recent DSOD report indicated that the design and construction of the dam should allow the dam to withstand significant seismic loading and that further review of the dam's stability is not recommended at this time.

3.4.2 Existing Facilities

Lower Crystal Springs Dam is an approximately 140-foot-high and 600-foot-wide concrete structure located within the San Mateo Creek canyon, as shown in **Figure 3-2**. The top of the dam is 43 feet wide and lies at an elevation of about 281 feet, and the base of the dam has a thickness of 176 feet. A concrete wall on the upstream side of the top of the dam, referred to as a parapet wall, raises the height of the structure to an elevation of 292.6 feet. An 88-foot-wide opening in the center of the parapet wall allows floodwaters to enter the spillway and pass over the dam to San Mateo Creek. **Figure 3-3** is a photograph of the upstream face of the dam showing the existing parapet wall and spillway. The spillway is divided by concrete piers located midway across the dam crest, and these piers are used to support stoplogs that control the crest elevation of the spillway. The stoplogs consists of eight wooden beams that fit between piers in the spillway; when the stoplogs are installed, they create a wooden wall that can incrementally raise the effective elevation of the spillway crest. The crest of the spillway is at an elevation of 283.8 feet without the stoplogs in place (about 9 feet below the top of the parapet wall), but with all the stoplogs in place, the crest of the spillway can be raised to an elevation of 291.8 feet. The spillway is currently designed for flows of approximately 4,600 cubic feet per second (cfs), compared to the estimated 25,000 cfs associated with the PMF (SFPUC, 2010).

Prior to 1983, before the DSOD imposed operating restrictions on the LCSD, the SFPUC routinely installed stoplogs in the spillway, which enabled the SFPUC to maximize storage in Crystal Springs Reservoir. Since 1983, consistent with the DSOD's directive, the SFPUC has reduced the maximum normal water surface elevation in Crystal Springs Reservoir from 291.8 to 283.8 feet. The DSOD restrictions allow the SFPUC, with written permission, to increase the storage capacity of the reservoir and raise the water surface elevation by 4 feet (to 287.8 feet) by installing up to four stoplogs when large storms are expected over the watershed.[3] The increased storage capacity enables the SFPUC to capture and use the stormwater as part of the regional water supply and reduce the risk of downstream flooding as a result of a release or spill at the LCSD.

A stilling basin is located at the downstream toe of the dam, as shown in **Figure 3-4**; it is about 102 feet wide (extending along the toe of the dam) and about 32 feet long (extending along San Mateo Creek). In the event of an uncontrolled spill, water flowing over the spillway and down the downstream face of the dam enters the stilling basin before flowing to San Mateo Creek. The purpose of the stilling basin is to prevent scour of the dam foundation and to dissipate the energy of the rapidly moving water before it reaches the creek where it could erode the creek bed and banks. Crystal Springs Reservoir also includes a series of pipelines and valves below the LCSD to allow for the controlled release of water from Crystal Springs Reservoir to San Mateo Creek.

An approximately 450-foot-long reach of San Mateo Creek immediately downstream of the stilling basin at the LCSD includes two in-channel pools. Pool 1 lies upstream of Pool 2. The stilling basin and the two pools are separated by two short sections of wetlands through which the creek runs in poorly defined channels. A 60-inch-diameter pipe discharges to Pool 1, and ten smaller pipes discharge to Pool 2. The SFPUC uses the pipes to discharge water from Crystal Springs Reservoir and the adjacent Crystal Springs Pump Station to San Mateo Creek. The pools were created by scour resulting from past large discharges of water from the pipes. Discharges from the pipes occur infrequently, but there is a small amount of continuous leakage from the pipes.

3.4.3 Current Operations

The SFPUC's regional water system conveys Tuolumne River water about 170 miles from its primary water source in Yosemite National Park to users in the San Francisco Bay Area through the Hetch Hetchy Aqueduct. The Hetch Hetchy Aqueduct also conveys water from the Alameda Creek watershed to the San Francisco Bay Area. The SFPUC stores as much water as possible in its local reservoirs in the Bay Area to minimize water shortages during droughts; to maintain water deliveries during maintenance or emergency outages when or if other parts of the regional system have to be taken out of service; and to meet the high demand in the summer. Accordingly, the SFPUC's primary operating goal for Crystal Springs Reservoir is to maximize local storage of a combination of Hetch Hetchy Aqueduct water and local watershed runoff.

The SFPUC aims to fill Crystal Springs Reservoir to its maximum capacity by the end of the rainy season in the Bay Area (i.e., mid to late spring) and the snowmelt season in the Sierra Nevada. Water from the Tuolumne River (the primary source of water in Crystal Springs Reservoir) and the Alameda Creek watershed enters the reservoir at its south end through the Pulgas Discharge Channel near the Pulgas Water Temple, a terminus of the Hetch Hetchy conveyance system from

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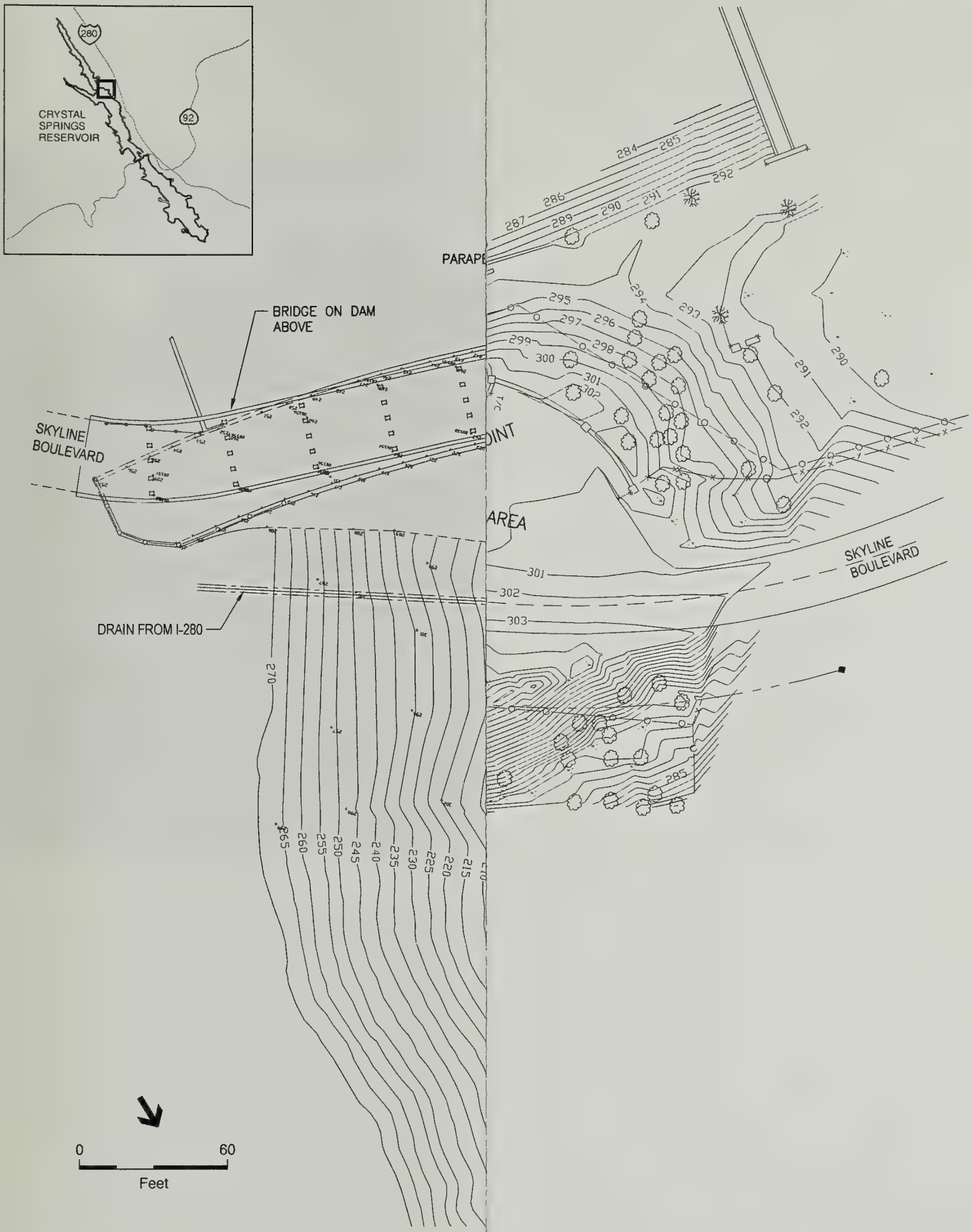
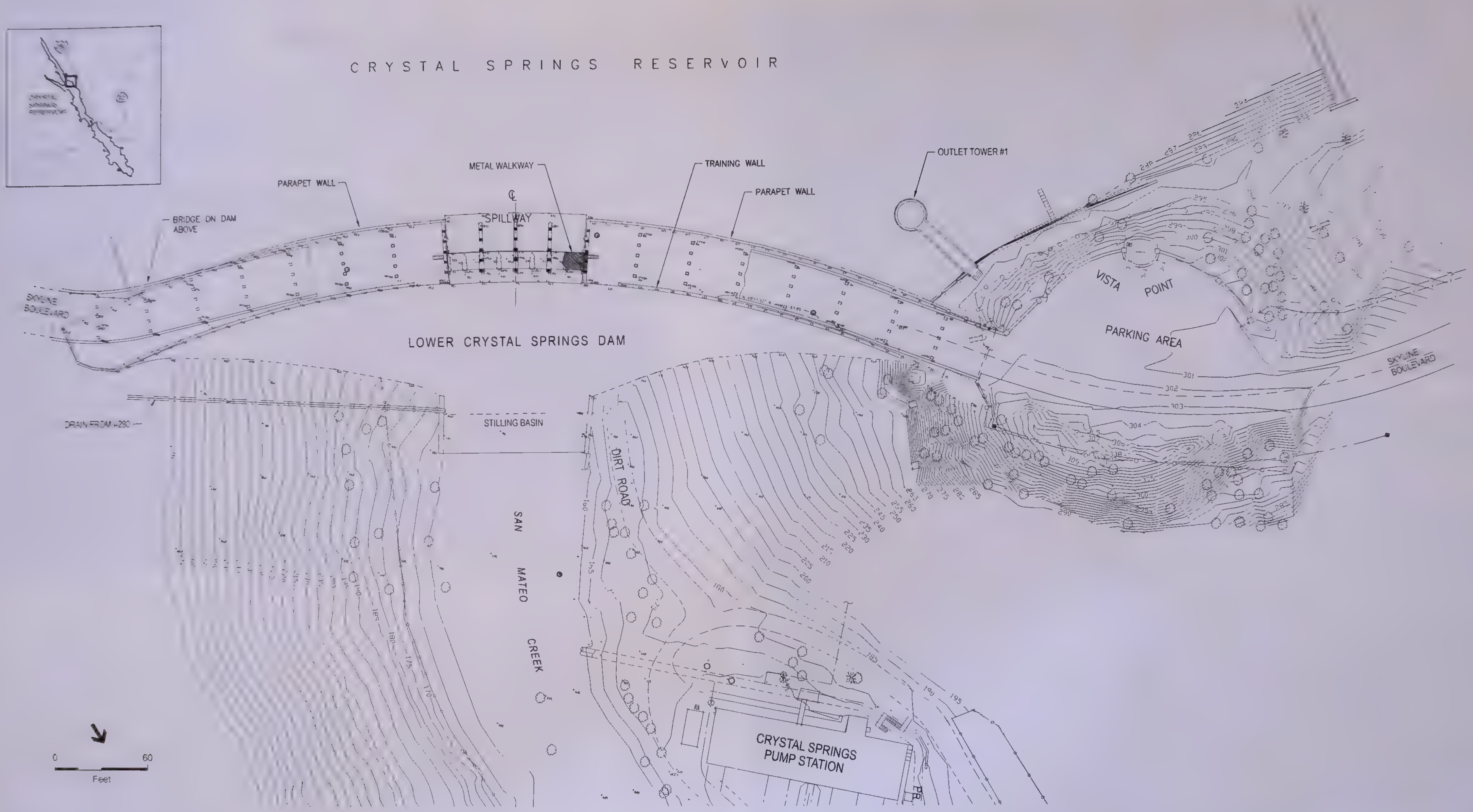
[3] Between 1983 and 2006, the SFPUC was permitted to use the stoplog system and exceed the DSOD-restricted storage elevation on nine occasions.



SOURCE: SFPUC, 2009

SFPUC Lower Crystal Springs Dam Improvements

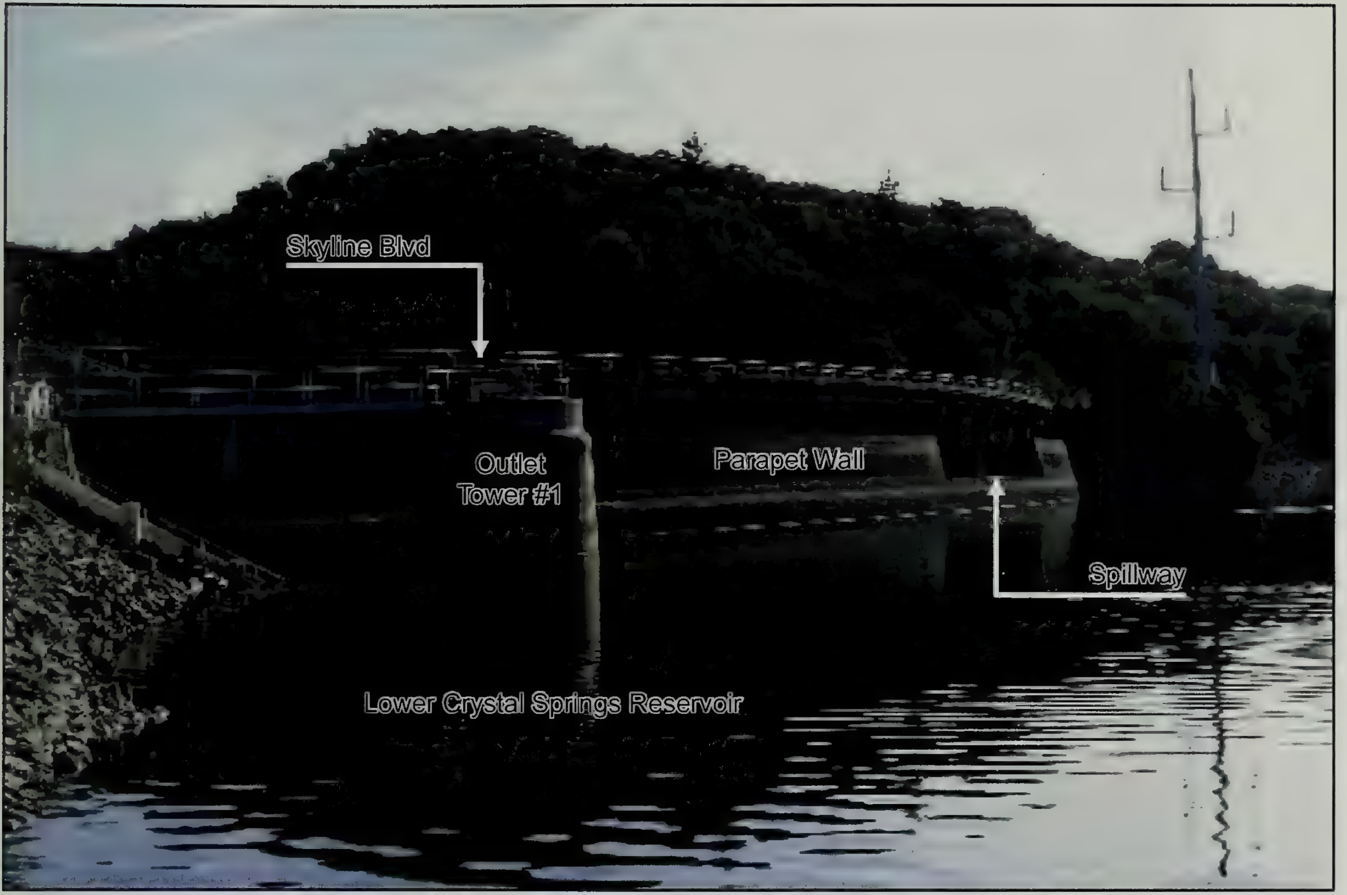
Figure 3-2
Lower Crystal Springs Dam, Existing Conditions



SOURCE: SFPUC 2009

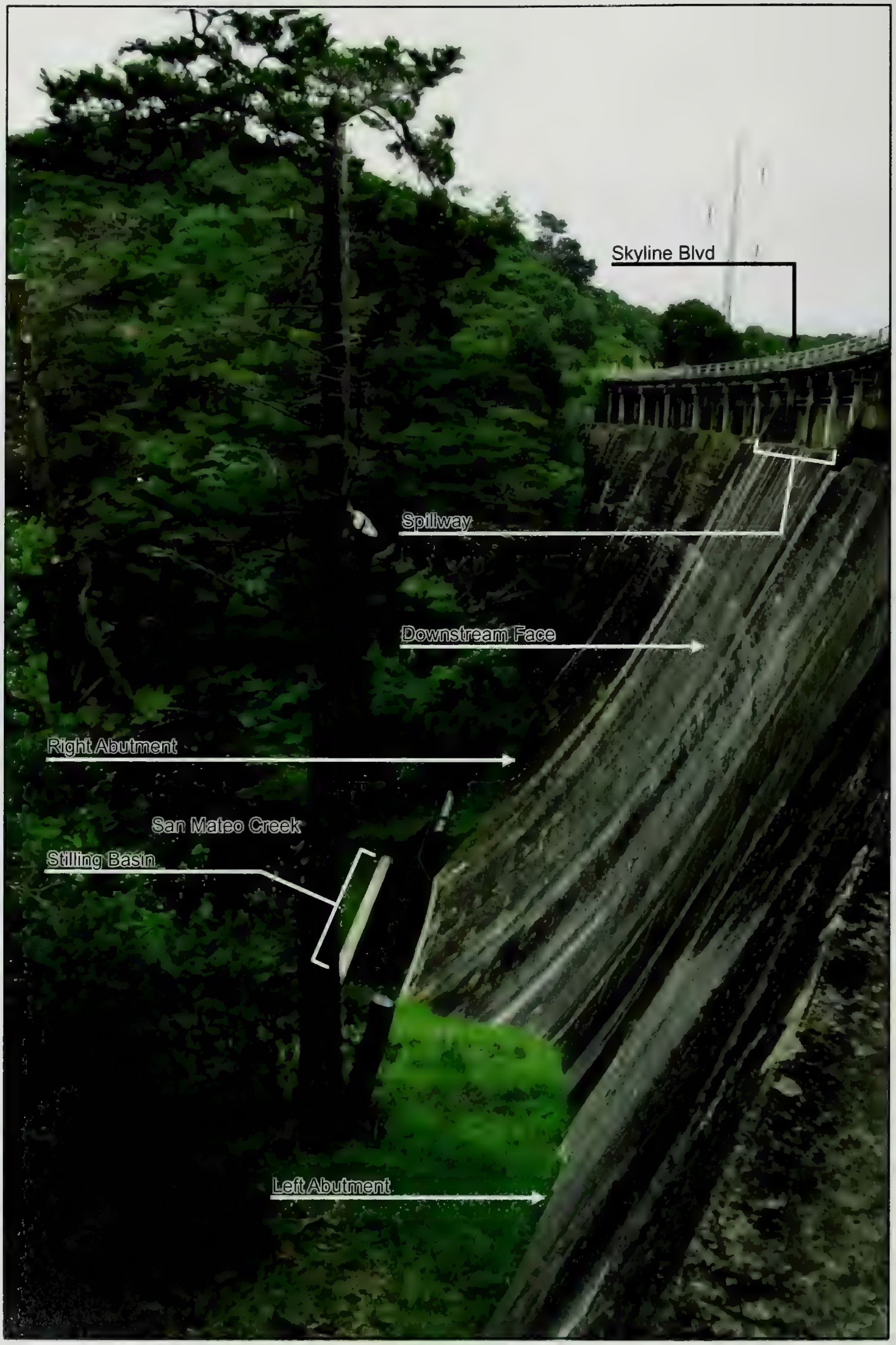
SFPUC Lower Crystal Springs Dam Improvements

Figure 3-2
Lower Crystal Springs Dam, Existing Conditions



SOURCE: Entrix, 2006

Figure 3-3
Photograph of Upstream Face of
Lower Crystal Springs Dam, Facing South



SOURCE: Entrix, 2006

SFPUC Lower Crystal Springs Dam Improvements

Figure 3-4
Photograph of Downstream Face of Lower Crystal Springs Dam, Facing South

the Sierra Nevada. Water also enters the reservoir as runoff from the surrounding watershed. Storage in the reservoir typically reaches its maximum at the end of May, and SFPUC operators then draw down the reservoir in June, July, and August when stored water is used to meet high summertime demand. Water from Crystal Springs Reservoir is pumped to San Andreas Reservoir where it is withdrawn, treated at the Harry Tracy Water Treatment Plant, and conveyed to users.

Between November and March, the SFPUC keeps the water surface elevation at Crystal Springs Reservoir several feet below the maximum normal operating elevation so that operators can accommodate runoff from the reservoir watershed without releasing or spilling water to San Mateo Creek. A wintertime flood reservation of about 2 billion gallons of storage capacity is maintained for this purpose. Releases and spills to San Mateo Creek occur very infrequently, generally only when water levels in the reservoir are at or near maximum levels and operators cannot pump water to San Andreas Reservoir quickly enough to prevent a release to San Mateo Creek. Spills and releases to the creek are usually the result of a single very large storm or a series of large storms over the Crystal Springs Reservoir watershed late in the rainy season. In the last 25 years, the SFPUC has made three to four controlled releases to San Mateo Creek through the valves below the dam, and there have been no uncontrolled spills to San Mateo Creek over the top of the dam through the spillway.

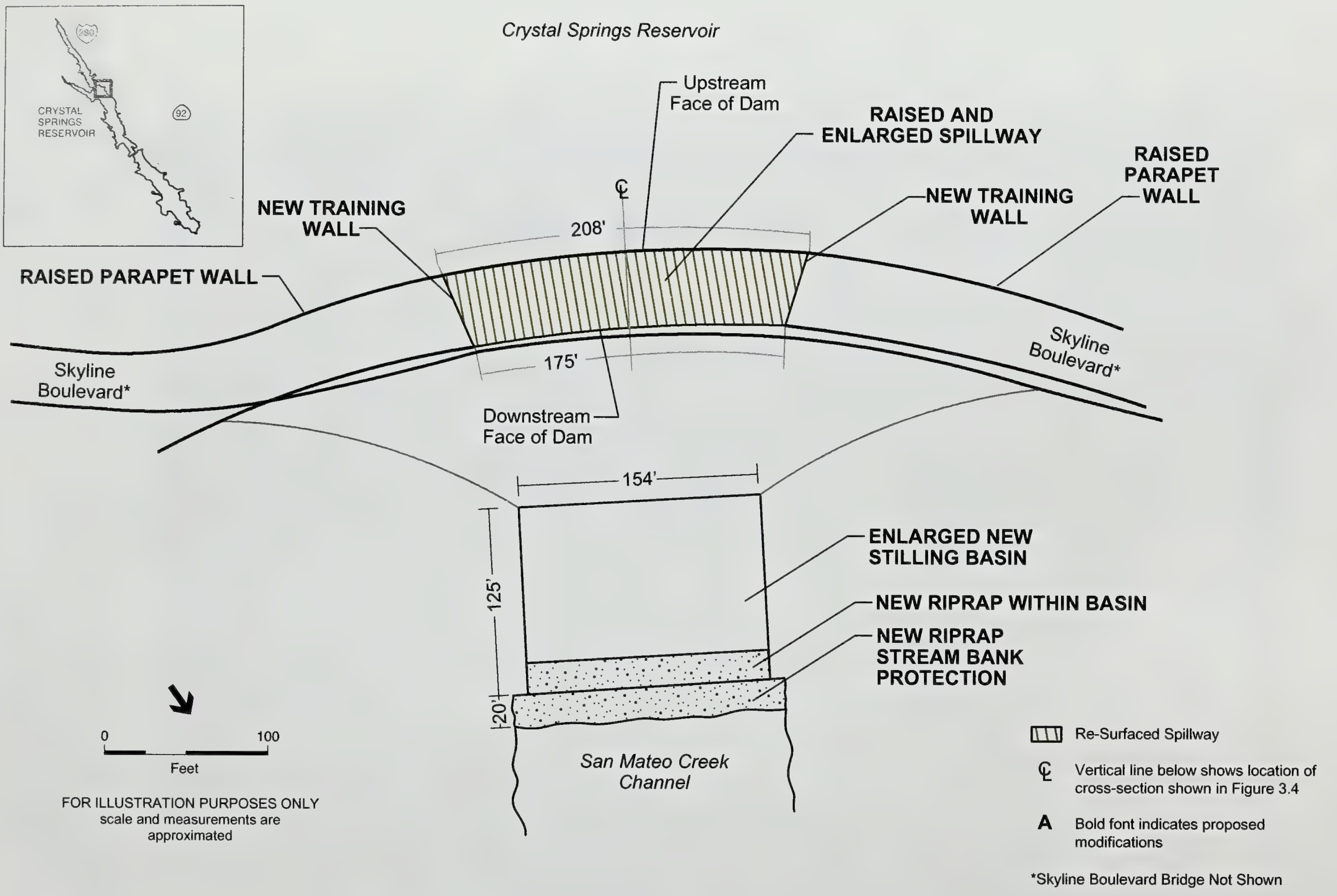
3.5 Project Components

The proposed project consists of modifying various features at the top and toe of the LCSD, as well as modifying Sampling Station #5 (SFPUC, 2009c). On the top of the dam, the parapet wall would be raised, and the spillway would be widened and its crest reshaped. Drainage from the top of the dam would also be improved. At the base of the dam, the stilling basin would be removed and replaced with a larger basin. Large rock (referred to as riprap) would be placed and grouted with concrete in the San Mateo Creek channel immediately downstream of the enlarged stilling basin to prevent erosion and potentially undermining the stilling basin itself.

As an ancillary component of the LCSDI project, the SFPUC would raise the elevation of Sampling Station #5 at the Pulgas Discharge Channel. The sampling station was constructed when the DSOD restrictions were in place. With implementation of the proposed project, reservoir operating levels could be higher than the elevation of the sampling station. Thus, the sampling station must be raised so that the sampling equipment would not be inundated after the dam improvements are completed and proposed reservoir operations are implemented.

3.5.1 Parapet Wall and Spillway

The proposed improvements at the top of the dam are shown in **Figure 3-5**. The existing parapet wall extends from the north and south extremities of the LCSD to the existing spillway in its center. About 60 feet of the parapet wall would be demolished on each side of the spillway. The remaining parapet wall would be strengthened by increasing its thickness, and raised by about 9 feet to a top elevation of 302 feet. The existing training walls that confine flow within the spillway and the supporting structure for the stoplogs would be demolished.


Crystal Springs Reservoir
CRYSTAL SPRINGS RESERVOIR
280
92
Upstream Face of Dam
RAISED AND ENLARGED SPILLWAY
RAISED PARAPET WALL
NEW TRAINING WALL
NEW TRAINING WALL
RAISED PARAPET WALL
℄
208'
175'
Skyline Boulevard*
Skyline Boulevard*
Downstream Face of Dam
154'
125'
20'
ENLARGED NEW STILLING BASIN
NEW RIPRAP WITHIN BASIN
NEW RIPRAP STREAM BANK PROTECTION
San Mateo Creek Channel
0
100
Feet
FOR ILLUSTRATION PURPOSES ONLY scale and measurements are approximated
▥ Re-Surfaced Spillway
℄ Vertical line below shows location of cross-section shown in Figure 3.4
A Bold font indicates proposed modifications
*Skyline Boulevard Bridge Not Shown

SOURCE: URS, 2006

SFPUC Lower Crystal Springs Dam Improvements

Figure 3-5
Proposed Modifications to Lower Crystal Springs Dam, Plan View

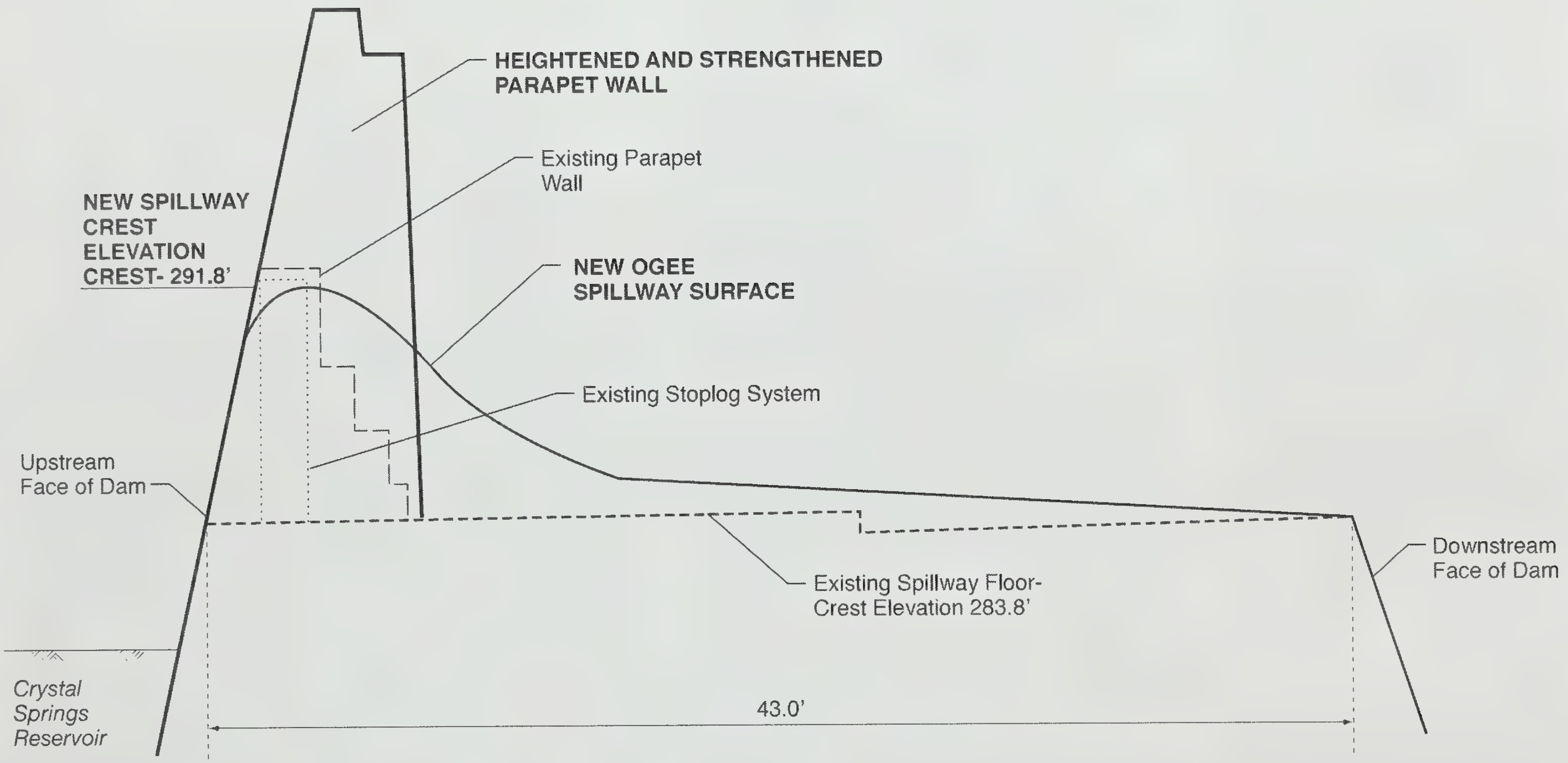
The spillway opening on the upstream side of the dam would be widened from its current 88 feet to 208 feet. The existing stoplog system would be replaced by a new concrete crest that would permanently maintain the dam crest at an elevation of 291.8 feet. The new spillway would be an ogee (i.e., curved) spillway designed to promote efficient water flow, which would minimize the risk of structural damage to the dam. New training walls would be built to confine water within the new spillway and guide it over the dam. Other spillway modifications would include installing access catwalks for operations and maintenance of the dam and constructing two new bridge piers (in cooperation with San Mateo County as part of its bridge replacement project, described in Sections 3.6 and 3.8, below). The DSOD has indicated that the proposed spillway design is adequate to accommodate the PMF (DSOD, 2006). A cross-section of the proposed new spillway is shown in **Figure 3-6**.

3.5.2 Drainage Improvements on the Top of the Dam

Lower Crystal Springs Dam was built using large interlocking concrete blocks. The tops of the blocks are not set at a uniform elevation, so there are depressions in the top of the dam. Rainwater, stormwater runoff, and water from hillside seeps have accumulated in one large depression, creating a permanent artificial pond near the south end of the dam. The pond currently provides breeding habitat for California red-legged frogs, a federally listed species. The presence of the listed species makes maintenance of portions of the dam extremely difficult. Prior to construction activities related to the proposed dam improvements, red-legged frogs on the top of the dam would be trapped and relocated to suitable habitat in accordance with approved protocols determined in consultation with state and federal agencies. Consistent with agency approvals, the pond and the rest of the top of the dam would be permanently drained by filling the depressed areas with crushed concrete and/or gravel and constructing drainage channels that drain to the downstream face of the dam so as to enable future maintenance of the top of the dam.

3.5.3 Stilling Basin and Creek Bank Protection

Under the proposed project, the existing 102-foot-wide by 32-foot-long concrete stilling basin at the toe of the LCSD would be demolished. A new, larger concrete stilling basin would be built to accommodate flows from the new, wider spillway, as shown in **Figures 3-5** and **3-7**. The new stilling basin would be 154 feet wide (extending along the toe of the dam) and 125 feet long (extending along San Mateo Creek). The floor of the basin would be 10 feet thick and would be anchored to bedrock. Wing walls would be attached to the sides of the spillway near the toe of the dam and would guide water flowing down the spillway into the stilling basin, and sidewalls would confine water within the basin. A line of concrete sill blocks perpendicular to the direction of water flow would be built within the stilling basin near its downstream end. A 20-foot section of the stilling basin downstream of the concrete sill blocks would contain grouted (e.g., concrete poured between the rocks to hold it in place) riprap. The concrete sill blocks and the grouted riprap would dissipate energy and slow the flow of water before it enters San Mateo Creek. Similar to the existing stilling basin, the new stilling basin would prevent damage to the foundation of the dam as well as prevent damage to the downstream creek. In addition, a 25-foot section of an existing chain link fence would be adjusted to accommodate the larger footprint of the proposed stilling basin. The remaining portion of the existing fence would remain in place.


HEIGHTENED AND STRENGTHENED PARAPET WALL
Existing Parapet Wall
NEW SPILLWAY CREST ELEVATION CREST- 291.8'
NEW OGEE SPILLWAY SURFACE
Existing Stoplog System
Upstream Face of Dam
Existing Spillway Floor- Crest Elevation 283.8'
Downstream Face of Dam
Crystal Springs Reservoir
43.0'

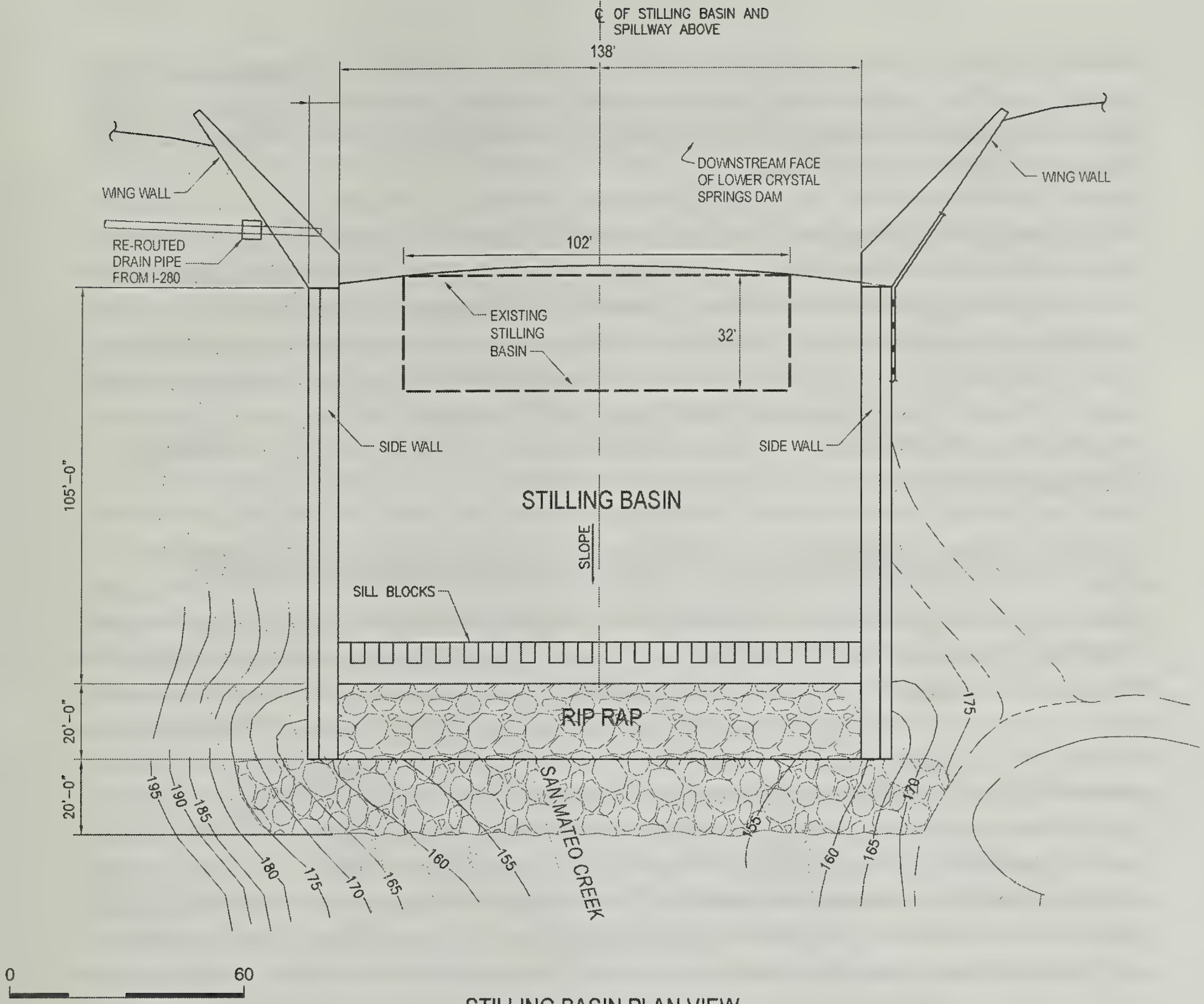
FOR ILLUSTRATION PURPOSES ONLY
scale and measurements are
approximated

A Bold font indicates proposed modifications

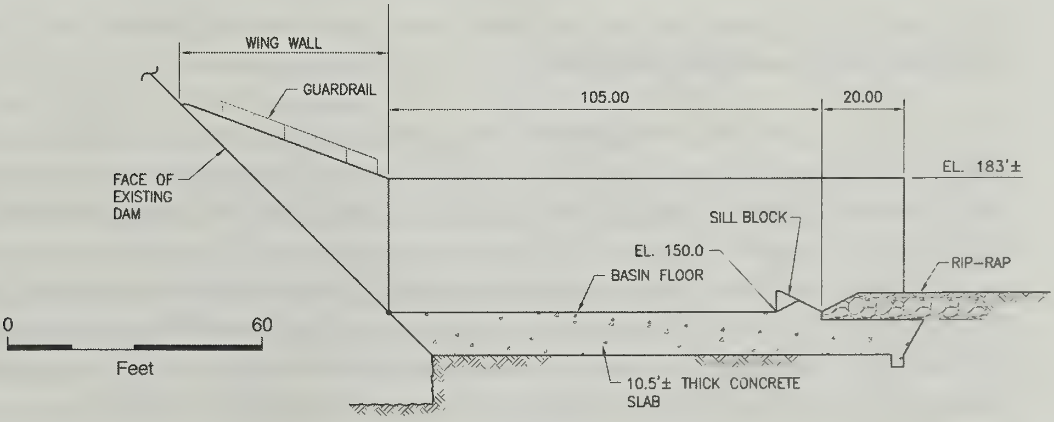
SOURCE: URS, 2007

SFPUC Lower Crystal Springs Dam Improvements

Figure 3-6
Proposed Spillway Modifications, Cross-section View



STILLING BASIN PLAN VIEW



CROSS SECTION THROUGH CENTERLINE OF STILLING BASIN

SOURCE: URS, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 3-7
Proposed Stilling Basin Modifications, Plan and Cross-section Views

Immediately downstream of the stilling basin, an additional 20 linear feet of riprap grouted with concrete would be installed within the creek channel to further protect the creek bank and stilling basin. There would be a total of 40 linear feet of grouted riprap, with 20 feet within the stilling basin and 20 feet in the creek channel.

The proposed stilling basin and creek bank protection would be located within the San Mateo Creek channel and the immediately surrounding riparian habitat, including the area occupied by the existing stilling basin. The area below the existing stilling basin encompasses a portion of the perennial stream channel, which has minimal flows during the dry season[4] and includes a reach of the creek referred to as Pool 1. Pool 1 is a scour hole caused by past discharge from the reservoir through a now inoperable outlet pipe; Pool 1 maintains standing water year-round. This pool would be eliminated with construction of the new stilling basin and installation of creek bank protection.

3.5.4 Sampling Station #5 on the Pulgas Discharge Channel

Water from the Alameda Creek watershed and Tuolumne River enters Crystal Springs Reservoir at its south end through the Pulgas Discharge Channel. Sampling Station #5 is mounted over the channel at an elevation of 287.5 feet, and the SFPUC uses it to measure the quality of water flowing through the channel. This sampling station was built at the time the DSOD restrictions were set, and it would need to be modified to continue proper functioning under the proposed project. With the proposed project, the maximum normal water surface elevation in Crystal Springs Reservoir would be 287.8 feet, but there would be times when the water surface elevations could be as high as 291.8 feet (see Section 3.7, below). Thus, the sampling station equipment could be inundated at times under future project conditions. As part of the proposed project, the SFPUC would keep the sampling station at the same location but would construct a new foundation and footings to raise the sampling station by about 5 feet, to an elevation of approximately 292.5 feet.

3.6 Project Construction

This section describes the most probable construction scenario for the LCSDI project. For the purposes of the environmental analysis in this document, conservative assumptions have been made regarding project construction in order to depict the maximum, reasonable extent of foreseeable environmental impacts, but the contractor responsible for construction might choose to use different equipment and construction methods than those described below. Any changes proposed by the contractor that fall outside the scope of analysis of this environmental impact report (EIR) could trigger the need for additional environmental review by the San Francisco Planning Department under the California Environmental Quality Act (CEQA).

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[4] During the dry season, typical flows in lower San Mateo Creek are less than 1 cubic foot per second (cfs). During the rainy season, flows in lower San Mateo Creek below the dam can increase to as much as 100 cfs due primarily to the discharge of stormwater runoff from I-280 into the stilling basin from where it flows into the creek. See Chapter 5, Section 5.15, Hydrology and Water Quality, for further description.

3.6.1 Schedule

Construction of the proposed dam improvements is expected to take up to 14 months, including periods with 24-hour-per-day construction. Work is scheduled to begin in early 2011, with project completion by early spring 2012. All major construction activities are scheduled to occur during a 9-month period from March through November 2011, with "substantial completion" of all construction by the end of this period. The remaining 5 months in the overall construction schedule are allocated for contractor mobilization and demobilization in addition to a contingency period for corrections to construction work that may not meet specifications and inspections of construction work after "substantial completion."

The construction schedule was developed to ensure ongoing water deliveries to customers, but, more importantly, to ensure that the structural integrity of the dam is maintained during construction. As described above, the SFPUC operates the dam in a manner intended to prevent spills or releases into San Mateo Creek, but there remains the possibility that a series of large winter storms could cause water to overtop the spillway and flow into the creek. If such a spill were to occur during construction activities when there is no functioning spillway or stilling basin, the structural integrity of the dam could be compromised. From a dam safety perspective, it is critical to have a functioning spillway and stilling basin during the rainy season to control the reservoir water releases (URS, 2009).

Therefore, although the SFPUC would attempt to limit construction activities that would affect spillway operations to the dry season—the period between April 15 and October 15—it is anticipated that major work would begin in March and continue past October 15. The SFPUC has thus proposed a tight construction schedule, and it is expected that the construction contractor would be required to add shifts and perform night work to maintain the proposed schedule. The schedule assumes that many activities would be performed concurrently at several locations using multiple crews and equipment to the maximum extent allowed by the physical constraints of the site.

Work hours at the construction site would vary depending on the nature of the construction activities occurring at any particular time and the status of the project with respect to the schedule. It is assumed that work at the LCSD site would be performed in three shifts at least part of the time. The shift start and end times could vary, but typically the day shift would extend from 6 a.m. to 2:30 p.m., the swing shift from 2 p.m. to 10:30 p.m., and the night or graveyard shift from 10 p.m. to 6:30 a.m. Day shift work would continue for the duration of project construction, and swing and night shift work would occur only as necessary to make efficient use of the workforce and equipment. Night shift work is likely to be necessary during stilling basin excavation, major concrete pours, and other activities where time is critical. Night shift work could occur for up to six months at both the top and toe of the dam but would probably have a much shorter duration. Temporary site lighting would be necessary during parts of the day and swing shifts and throughout the night shift.

Construction at Sampling Station #5 would be completed in about four months during the dry season and would occur concurrently with construction at the dam site. Construction activities at this site would be limited to weekdays, day shift only, and it is likely that the work at the sampling station would be performed by a separate crew from those working at the dam.

3.6.2 General Construction Activities

3.6.2.1 Coordination with San Mateo County

As described in Section 3.2, Project Location, the Skyline Boulevard Bridge traverses the crest of the LCSD. The bridge is supported on piers mounted on the dam and is owned by San Mateo County. The SFPUC would coordinate the timing of LCSDI project construction with San Mateo County to ensure that the project would commence only after the county demolishes the bridge. Currently, the bridge is in disrepair and is vulnerable to failure or damage in an earthquake. San Mateo County owns easement rights for the Skyline Boulevard Bridge[5] and is proposing to demolish the bridge and replace it with a new, seismically and structurally sound bridge. In 1986, San Mateo County analyzed the structural integrity of the Skyline Boulevard Bridge and found it to be structurally incapable of withstanding the Maximum Credible Earthquake for the area. A condition assessment performed by San Mateo County in 2002 concluded that the bridge was seismically unsafe and that it had 6 to 10 years of remaining useful life. The California Department of Transportation (Caltrans) has also recommended that San Mateo County replace the bridge. Demolition of the bridge and construction of the replacement bridge would require closure of this section of Skyline Boulevard. As described in Section 3.8, below, this bridge replacement project has undergone CEQA review (San Mateo County, 2009).

Currently, the SFPUC is coordinating the LCSDI project with San Mateo County in the design and construction of the bridge. Prior to LCSDI construction activities at the top of the dam, the SFPUC would schedule construction activities in this area in coordination with San Mateo County to minimize the length of time that this section of Skyline Boulevard would be closed. The SFPUC intends to commence construction as soon as possible after San Mateo County demolishes the Skyline Boulevard Bridge and demobilizes its construction site. Following completion of the LCSDI construction activities at the top of the dam, San Mateo County would construct the new bridge on new bridge piers, two of which would be constructed on the dam as part of the LCSDI project.

3.6.2.2 Staging and Storage Areas

Staging and storage areas would be needed adjacent to the construction sites at the top and toe of the dam as well as adjacent to the boat ramp. These areas would be used for construction offices, parking, and storage of equipment and materials. The staging and storage areas in the LCSD vicinity are shown in **Figures 3-8** and **3-9** and listed in **Table 3-1**. Area 9, located adjacent to an existing boat ramp, would be needed only if the contractors determine that barges are required for construction; this area would be used for temporary parking or storage of equipment while the barges are being launched, but would not be used for extended storage during construction. Storage and staging areas at the Sampling Station #5 site are described below in Section 3.6.5.

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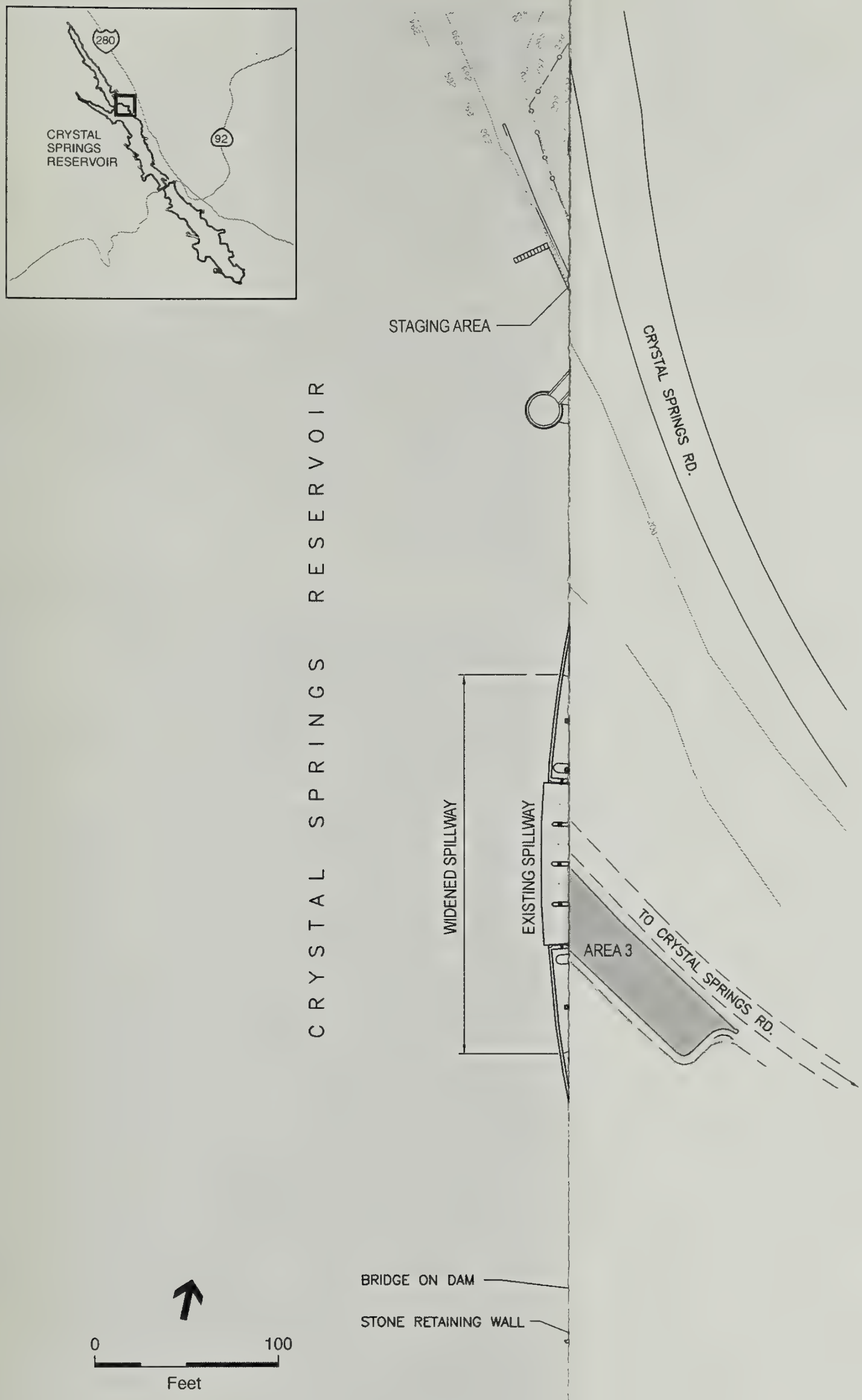
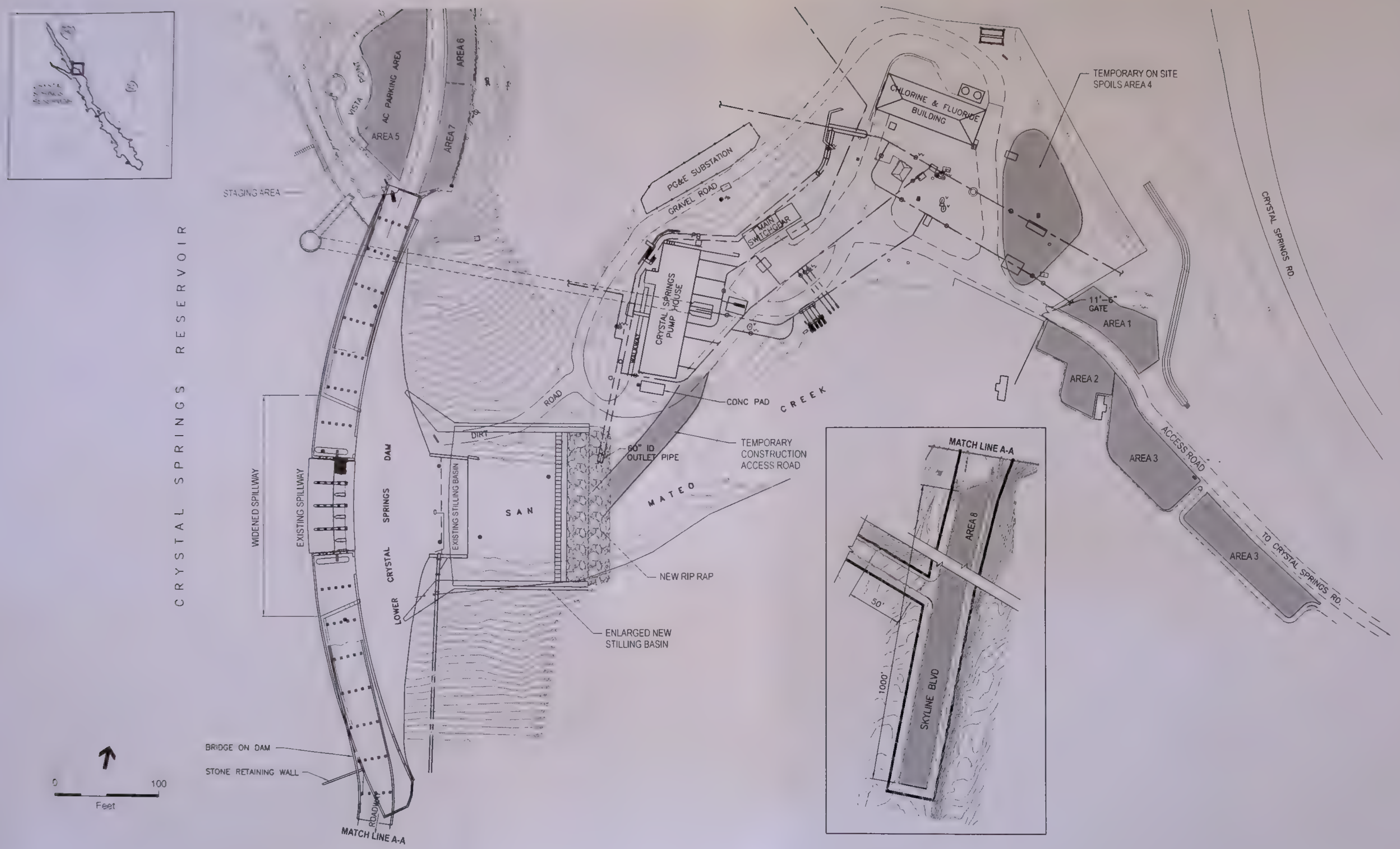
[5] The easement rights are pursuant to a deed between the Spring Valley Water Company and the State of California. The SFPUC and San Mateo County are the successors in interest to the rights of the Spring Valley Water Company and the State of California, respectively.



SOURCE: URS, 2009

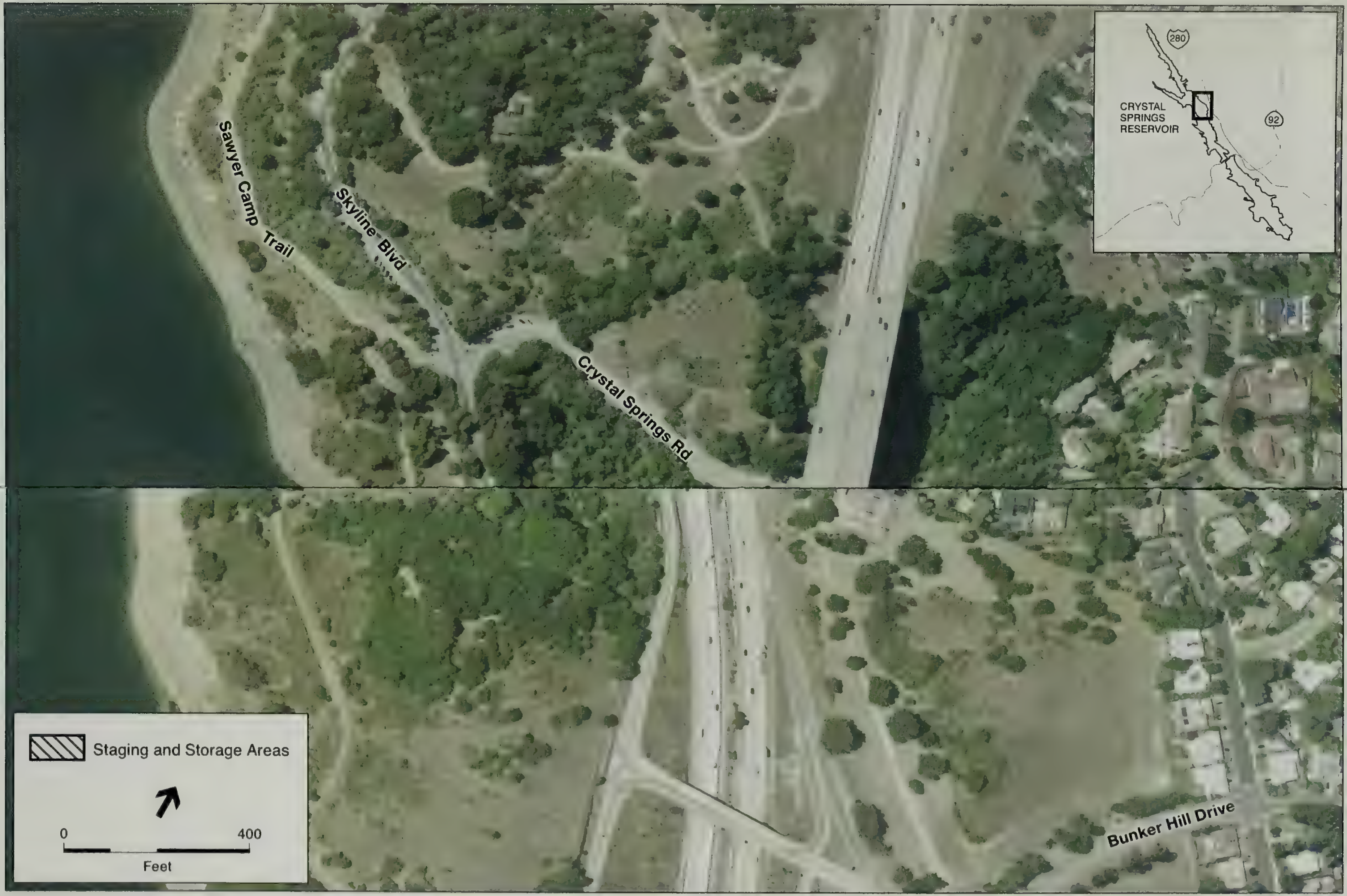
Figure 3-8
Staging and Storage Areas in the Lower Crystal Springs Dam Vicinity



SOURCE: URS 2009

SFPUC Lower Crystal Springs Dam Improvements

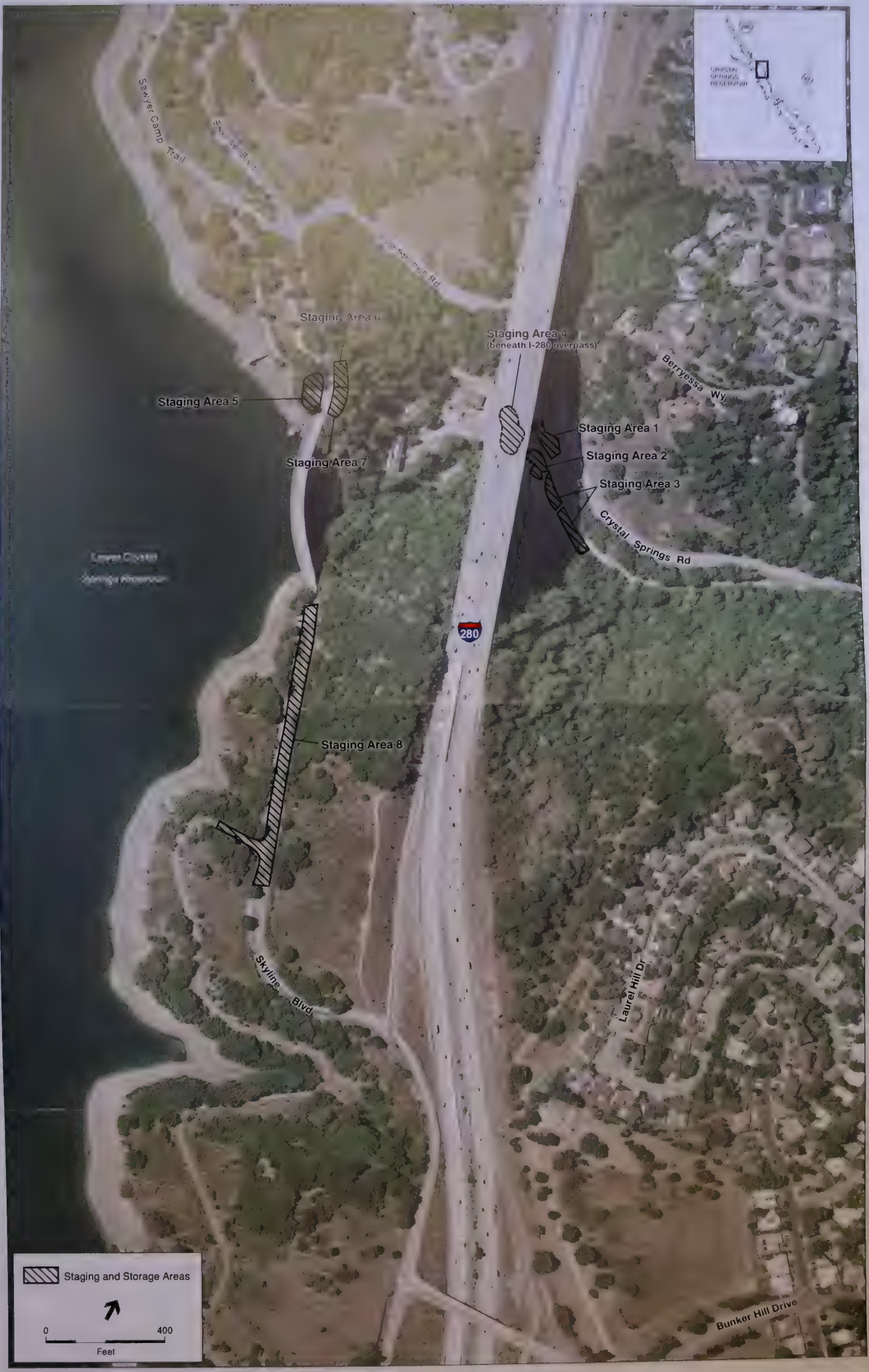
Figure 3-8
Staging and Storage Areas in the Lower Crystal Springs Dam Vicinity



SOURCE: ESA + Orion, 2009

SFPUC Lower Crystal Springs Dam Improvements

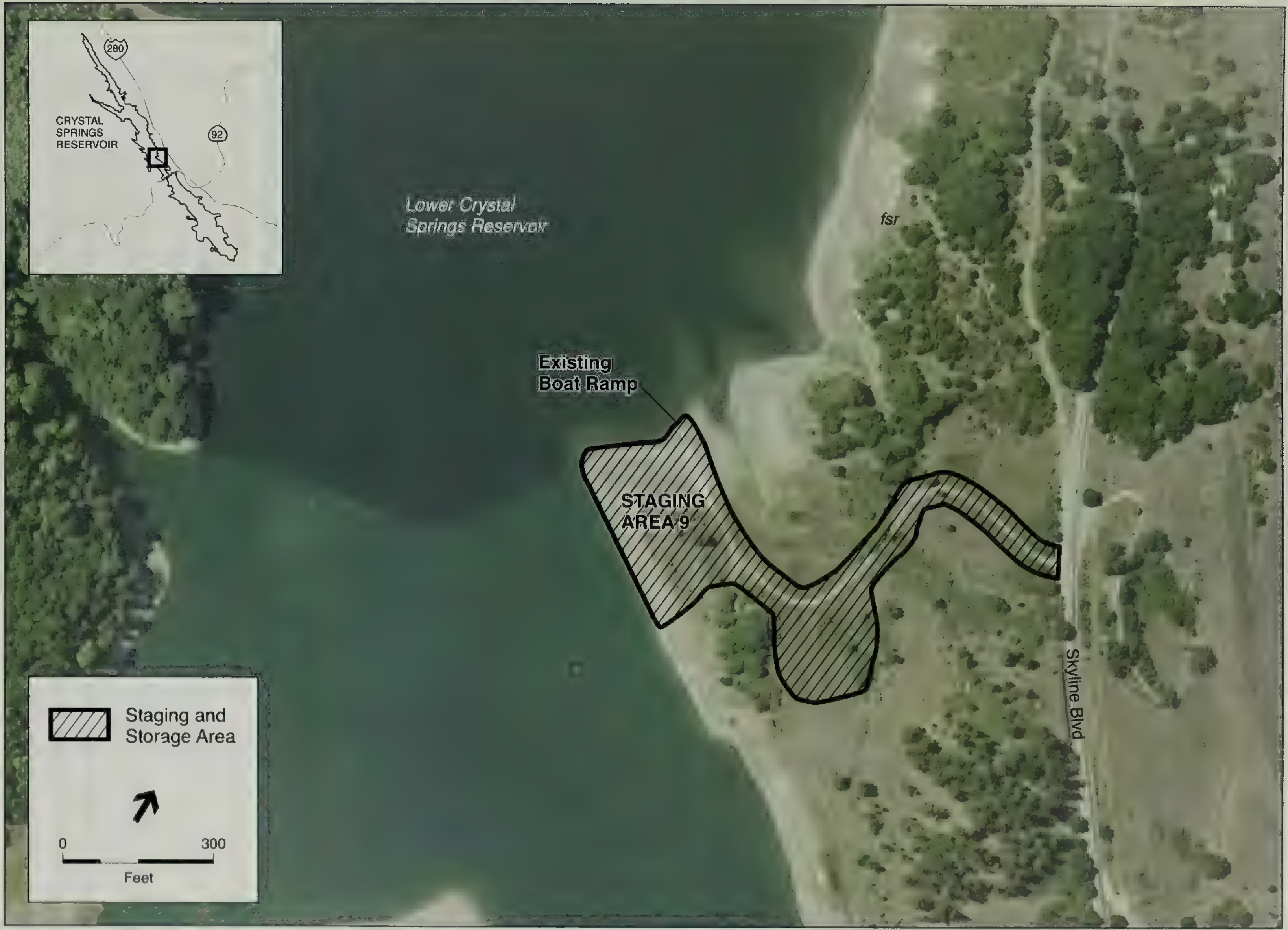
Figure 3-9a
Staging and Storage Areas in
LCSD Vicinity – Aerial Base



SOURCE ESA + Orion, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 3-9a
Staging and Storage Areas in LCSD Vicinity – Aerial Base



SOURCE: ESA + Orion; SF Planning Department, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 3-9b
Staging and Storage Areas in LCSD Vicinity-Aerial Base

TABLE 3-1
STAGING AND STORAGE AREAS

Area Number	Site	Site Area (square feet)
1	Spoils storage area	3,300
2	Staging area	3,200
3	Staging area	11,000
4	Spoils storage area	7,700
5	Vista point staging area	7,400
6	W. Skyline Boulevard office and parking area	2,000
7	W. Skyline Boulevard staging area	2,600
8	E. Skyline Boulevard staging area	26,000
9	Boat ramp staging area	208,200
Unnumbered	Office and parking area	2,300

NOTE: See Figures 3-8 and 3-9 for the locations of staging and storage areas.

3.6.2.3 Workforce and Equipment

The number of workers needed for the LCSDI project at the LCSD site would vary from 20 to 45, depending on the activities taking place and the number of crews that could work concurrently at multiple locations within the confines of the construction area. Construction workers would be encouraged to carpool because only limited parking would be available at the site in Areas 4, 5, and 8. At the Sampling Station #5 site, from 2 to 10 construction workers would be needed.

The construction equipment likely to be used to build the proposed project is listed in **Table 3-2**. If blasting is required for excavation at the stilling basin, pneumatic rock drills could be used in addition to typical excavation equipment.

3.6.3 Construction Activities at the Top of the Dam

3.6.3.1 Staging and Storage Areas

As shown in Figures 3-8 and 3-9 and listed in Table 3-1, storage and staging areas for construction activities at the top of dam are numbered 5 through 8 and would occupy 33,000 square feet, or less than one acre. Area 5 would be located on the north side of the dam and on the west side of Skyline Boulevard, entirely within the existing vista point parking lot on the north side of the dam. Areas 6 and 7 would be located on the north side of the dam, across from the vista point parking lot and on the east side of Skyline Boulevard, in and adjacent to the shoulder of the roadway. Since Skyline Boulevard would be closed during construction, Area 8 would occupy 1,000 linear feet of Skyline Boulevard on the south side of the dam in an area that includes the roadway and the shoulder west of the road, including use of an existing SFPUC watershed access road for turning equipment around.

TABLE 3-2
CONSTRUCTION EQUIPMENT LIKELY TO BE USED

Equipment	Top of Dam	Toe of Dam	Sampling Station #5
Excavators		✓	✓
Excavators/backhoes with concrete breaker	✓	✓	
Bulldozers		✓	
Loaders	✓	✓	✓
Graders		✓	
Drill rigs	✓	✓	
Air compressors	✓	✓	✓
Forklifts	✓	✓	✓
Generators	✓	✓	✓
Portable light stands	✓	✓	
Cranes	✓	✓	✓
Concrete pumps	✓	✓	
Ready-mix concrete trucks	✓	✓	✓
Dump trucks	✓	✓	✓
Grouting equipment	✓	✓	
Rock/concrete crusher	✓		
Welding equipment			✓
Water truck		✓	
Barges and motor boat	✓		

It is possible that the contractors could perform some of the demolition and construction work at the top of the dam from barges on the reservoir. If so, barges would consist of a series of floating blocks that can be connected and locked together to form a large floating platform for construction purposes. Barges would be steam-cleaned prior to launching in conformance with SFPUC watershed land protection procedures (SFPUC, 2001). The barges would be launched from the boat ramp in Lower Crystal Springs Reservoir at the start of construction (see Figure 3-9b). Staging Area 9, located adjacent to the boat ramp, would only be used if equipment needs to be turned around, temporarily parked, or stored while the barges are being launched. Barges would be floated to the dam, pushed into place with a motor boat, fastened to the parapet wall, and remain there until construction is complete. Barges would be removed from the reservoir with a motor boat at the end of construction. Cranes would not be needed on the barges because all crane work could be performed from the top and/or the north and south abutments of the dam, but other demolition and construction activities would be done from the barges, as described below.

3.6.3.2 Clearing and Excavation

Minor brush clearing would occur at Staging Area 6. Excavation and grading for Staging Area 7 would be needed, totaling about 47 cubic yards, to create a flat spot for construction offices and parking. Following construction, the site would be recontoured and revegetated to restore the existing grade and site conditions. No trees would be removed.

3.6.3.3 Demolition

After San Mateo County demolishes the Skyline Boulevard Bridge, the SFPUC would commence construction work on top of the dam. Prior to demolition of the unneeded structures, California red-legged frogs on the top of the dam would be trapped and relocated to suitable habitat in accordance with approved protocols (as determined in consultation with state and federal agencies), and the pond and the entire top of the dam would be permanently drained. Cranes operating from the top and/or the north and south abutments of the dam would lift demolition equipment into place. Portions of the parapet walls and the spillway training walls would be removed using concrete saws and excavators with concrete breakers mounted on their arms; demolition of the parapet walls on the upstream side of the dam could be done from barges. Temporary netting and/or debris-catching structures would be placed to prevent broken concrete from falling into Crystal Springs Reservoir, and could be installed from the barges. Broken concrete would be removed from the top of the dam using cranes, loaded into trucks, and stockpiled at a staging area north or south of the dam. A rock crusher located at the staging area would crush some of the concrete to drainage-rock size for possible later use to fill depressions in the top of the dam. Any remaining waste concrete would be hauled to a disposal site.

3.6.3.4 Construction

Cranes operating from the top and/or the north and south abutments of the dam would lift construction equipment and materials to the top of the dam. Platforms would be set up over the existing parapet wall to support the equipment necessary to drill holes in the wall and install anchors, which would be grouted into the structure to tie together existing and new portions of the wall and spillway. Forms would be erected and reinforcing steel would be fixed in place for the parapet wall, spillway, training wall, and piers for the replacement Skyline Boulevard Bridge. Concrete trucks would deliver ready-mixed concrete to the north and south abutments, which would be placed into the forms using boom-type concrete pumps. The depressions on the top of the dam would be filled with crushed concrete and/or gravel, and drainage channels would be constructed to drain to the downstream face of the dam. Construction activities for these improvements would occur from either side of the dam or from temporary access structures on the crest of the dam, although the contractor might choose to conduct some of these activities from barges in the reservoir. Work that could be done from barges includes installing temporary safety barriers or structures at the spillway, constructing formwork for the new spillway and parapet, and performing concrete finish work on the upstream dam face. During construction, it would be necessary to keep the elevation of the reservoir 2 to 4 feet below the current maximum operating level (283.8 feet) in order to facilitate construction work on the top of dam and to minimize the likelihood of water encroaching onto the top of the dam.

3.6.3.5 Demobilization and Site Restoration

All temporary buildings and equipment would be removed from the site after construction is complete. Areas used for construction would be restored to their preconstruction condition. The SFPUC would coordinate site restoration activities with San Mateo County, which would commence construction of the new Skyline Boulevard Bridge following the completion of dam improvements at the crest of the dam.

3.6.4 Construction Activities at the Toe of the Dam

3.6.4.1 Staging and Storage Areas

The staging and storage areas for construction activities at the toe of the dam are shown in Figure 3-8 and listed in Table 3-1. They are numbered Areas 1 through 4 and would occupy a total of 25,200 square feet, or about 0.6 acre. Area 1 is the vacant area north of the access road from Crystal Springs Road, and Areas 2 and 3 are the vacant areas south of the access road. Area 4 is the vacant area east of the gravel road near the abandoned chlorine and fluoride building.

3.6.4.2 Site Preparation and Clearing

At the downstream edge of the proposed stilling basin site, an inoperable 60-inch-diameter pipe extends from the Crystal Springs Pump Station into Pool 1. Currently, water leaks from the pipe at a rate of less than 0.6 cubic feet per second. During construction, the leakage from the 60-inch-diameter pipe would be diverted to lower San Mateo Creek downstream of the construction zone in order to maintain the existing flow conditions in the creek. Construction activities would work around this pipe.

Pool 1 would be isolated from Pool 2 and dewatered as described below. As part of the site preparation activities, Pool 1 would be filled to provide a foundation for a temporary access road for construction vehicles and equipment to enter or exit the stilling basin site. The location of the temporary access road is shown on Figure 3-8. To install this access road, it would be necessary to remove vegetation (including trees) along a 200-foot-long corridor through the riparian area and stream channel near the toe of the dam between the existing access road near the Crystal Springs Pump Station and the site of the new stilling basin. Mature trees would be saved where feasible. The temporary road would be built in the cleared corridor of gravel and other engineered fill;[6] it would be about 35 feet wide at the base and 14 feet wide at the top and require about 600 cubic yards of engineered fill. The temporary road would be designed to minimize soil compaction of the wetland/riparian area and the potential for water quality impacts.

All trees and vegetation within the footprint of the new stilling basin and its associated riprap and within a 10-foot-wide buffer around the footprint would be removed. All vegetation within the absolute limits of construction may need to be removed, although vegetation would be saved where possible. Trees and other vegetation would also be removed at Staging and Storage Area 1. It is expected that approximately 28 trees with a diameter at breast height of 12 inches or greater would be removed, although the SFPUC would make decisions onsite with the contractors about which trees to remove. The SFPUC intends to save as many mature trees as possible.

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[6] Engineered fill is typically defined as a soil matrix that is nonhazardous, noncorrosive, free of organic matter (i.e., loam), well graded, and consisting of rocks or lumps less than 6 inches in greatest dimension. Engineered fill has a low expansion potential and is typically placed under controlled moisture and compaction conditions.

3.6.4.3 Demolition and Excavation

The stilling basin excavation would start at the upper limit of each abutment and proceed into the existing stilling basin. It is expected that the work would be performed concurrently at both abutments using tracked excavators (one at each abutment). Temporary shoring of the excavated face would be accomplished by installing soil nails and shotcrete as the excavation proceeds. This work would require drill rigs, air compressors, concrete pumps, and concrete transit trucks. The existing stilling basin would be broken up using an excavator with a concrete breaker mounted on its arm. Broken concrete would be removed using an excavator or front-end loader, loaded into trucks, and hauled to a disposal site in a timely manner.

The stilling basin excavation would extend to bedrock. The material to be removed is expected to consist of sand and clay with some rock. Any rock encountered above the bottom elevation of the foundation would be removed using a rock breaker. A tracked front-end loader might be used to remove material from the excavation and load it into trucks. Clean excavated material suitable for use as fill would be stockpiled at Areas 1 and 4 for later use by another SFPUC project, the Crystal Springs/San Andreas Transmission Upgrade (described in Section 3.8, below). If proposed construction of the Crystal Springs/San Andreas Transmission Upgrade project overlaps with construction of the proposed project, then clean excavated material from the stilling basin would not be stockpiled but would be used directly as fill for the foundation of the new Crystal Springs Pump Station proposed under that project. Unusable excavated material would be trucked to a disposal site

Due to the critical need to complete the majority of the dam improvements during the dry season, the contractor would need a contingency plan if conventional excavation methods are inadequate to meet the schedule. Controlled detonations (blasting) would be used as a last resort in the event of unforeseen conditions (e.g., if all other demolition methods prove to be insufficient for the types of rock materials encountered or if needed to meet the scheduling requirements). If the construction contractors encounter very hard rock or concrete during demolition and excavation for the stilling basin, blasting would speed up the demolition process. Controlled blasting is a demolition method that can be used to remove approximately 3-foot layers of rock or concrete. If blasting were required, the contractor would first drill 1.5-inch-diameter holes in a particular pattern determined by the blasting specialist. The holes would be filled with a specified amount of explosives and wired for detonation.[7] Once the area was prepared, a chain-link fence and a blast mat (rubber belting) would be placed over the area. Warning horns would sound before detonation. Blasting is usually over in a matter of seconds. Once a blast is over, an all-clear horn is sounded. Concrete or rock would then be removed using an excavator.

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[7] The contractor could use up to 150 pounds of explosives per blast and anywhere from 0.5 to 9 pounds per 8 millisecond delay.

It is assumed that blasting, if necessary, would take place during normal work hours (7 a.m. to 5 p.m). Typically, there would be one to two blasts per day; however, if the contractors determined it were necessary to conduct blasting during two work shifts, there would be two to three blasts per day. A potential blasting work schedule would require drilling until 7 a.m. and blasting shortly after 7 a.m. This would be followed by excavation and one more drill and blast cycle before 5 p.m., with excavation and drilling continuing after 5 p.m. Approximately 100 to 150 cubic yards of concrete could be removed each day with this technique.

3.6.4.4 Dewatering

Prior to construction of the new stilling basin, the existing stilling basin area, Pool 1, and the intervening shallow channel/marsh section would be dewatered through the use of pumps. To minimize the potential for groundwater seepage into the basin, the contractor might also need to extract some groundwater in the immediate vicinity of the stilling basin. Prior to dewatering operations, Pool 1 would be isolated from the creek channel at the downstream end to prevent water from seeping back into the pool. The pumped water would be treated by settling, filtration, or other means prior to discharge into San Mateo Creek in compliance with the discharge limits of the San Francisco Bay Regional Water Quality Control Board (RWQCB). For all dewatering operations, the pump's intake would be fitted with screens that meet California Department of Fish and Game and National Marine Fisheries Service criteria to prevent impacts on listed species. Qualified and permitted fish biologists would remain on site during the initial dewatering and would be available to rescue any fish found in Pool 1 prior to complete dewatering and relocate them to a suitable location within San Mateo Creek downstream of the construction site.

The sides of the excavation pit for the new stilling basin would be shored during construction, and all groundwater that surfaces in the stilling basin excavation sites (e.g., through weep holes in the shoring) would be pumped and treated prior to discharge to San Mateo Creek. The discharge would occur in accordance with requirements from the RWQCB. Dewatering would continue until the stilling basin foundation and riprap are constructed.

In addition, an existing 30-inch Caltrans drain pipe that carries runoff from I-280 extends from Skyline Boulevard to the south side of the stilling basin. During construction, about 60 feet of this drain pipe would be removed and rerouted downstream to keep any water from entering the work zone. The temporarily rerouted drain pipe would be placed in a location that would not create additional erosion or sedimentation in San Mateo Creek. Following construction, the SFPUC would install a new drain pipe and an anchor block on the existing alignment, directing the storm drain flow into the new stilling basin. SFPUC would coordinate with Caltrans to obtain any requisite permits or approvals for modifications to their drain pipe.

3.6.4.5 Construction

Construction equipment and materials would be brought to the stilling basin site using the temporary access road that would extend into the creek channel. The floor of the basin would be formed with concrete. Forms for concrete for the wing walls and sidewalls of the stilling basin would be erected and reinforcing steel fixed in place. Concrete trucks would deliver ready-mixed concrete to the end of the access road, and the concrete would be placed into the forms using boom-type concrete pumps. Alternatively, concrete trucks could deliver concrete to Skyline Boulevard near the dam abutments, and concrete could be piped into place from the top of the dam. Riprap would be moved into place using an excavator or crane and then grouted in place with concrete. Clean fill would be backfilled around the completed stilling basin structure.

3.6.4.6 Demobilization and Site Restoration

All temporary buildings and equipment used during construction would be removed from the site. Staging and Storage Areas 2 and 3 would be restored to their preconstruction condition. The temporary access road would be removed in its entirety, and the 200-foot-long corridor would be returned to pre-project conditions to the extent feasible. All disturbed areas would be graded to restore their natural contours and seeded to minimize erosion. Restoration of riparian and wetland areas would comply with the mitigation measures identified in this EIR and the permit requirements of federal and state resource agencies. Fill material would remain stockpiled at Areas 1 and 4, awaiting use during proposed construction of the Crystal Springs/San Andreas Transmission Upgrade project. However, if fill material is not used for the Crystal Springs/San Andreas Transmission Upgrade project (e.g., if SFPUC does not move forward with that project as proposed), it would be hauled offsite to the nearest landfill, and Areas 1 and 4 would be restored to their preconstruction condition. Leakage from the 60-inch pipe would be restored to its existing location in order to maintain existing flow conditions in San Mateo Creek.

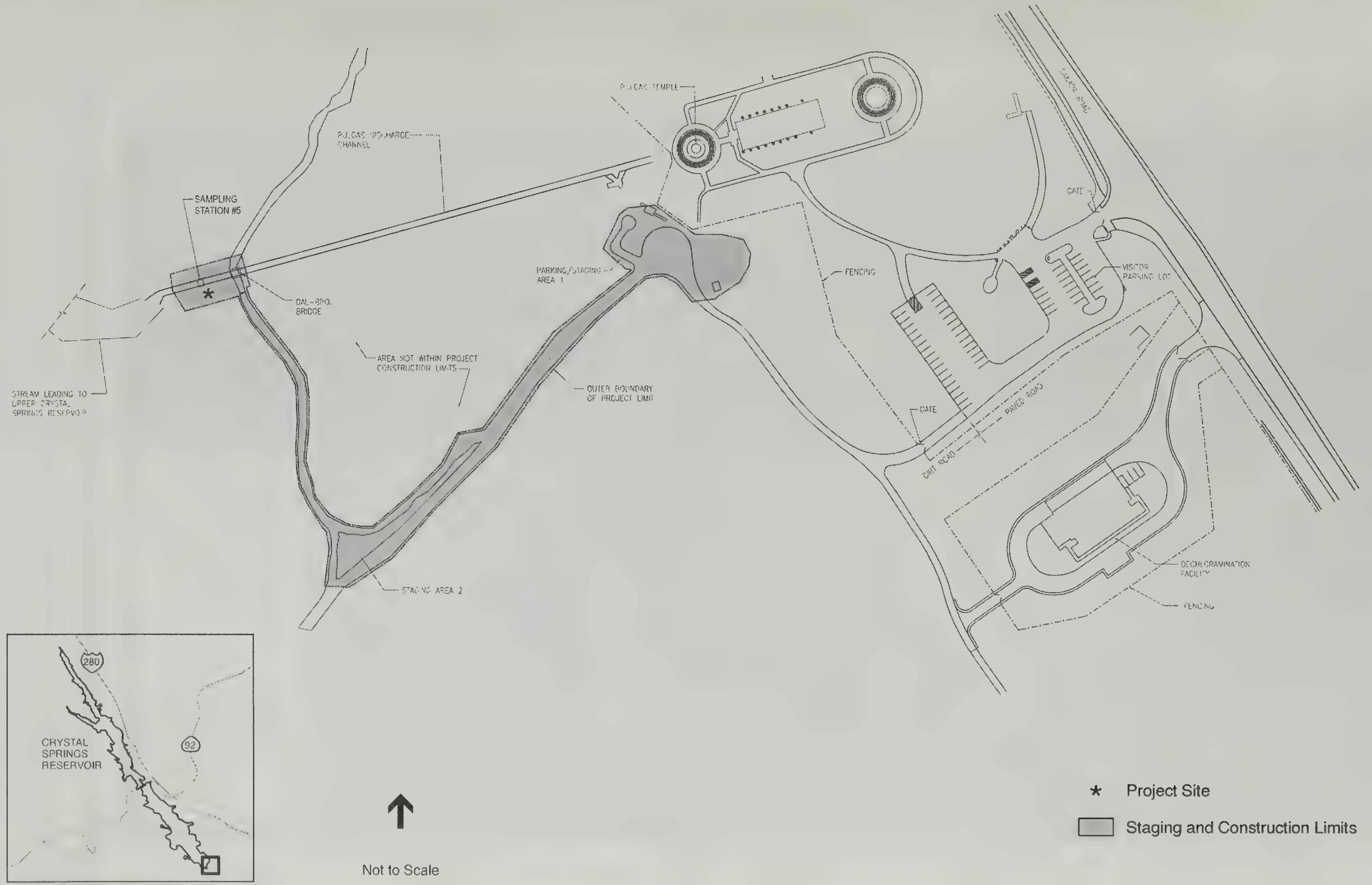
3.6.5 Construction Activities at Sampling Station #5

The construction site, including staging areas, for the proposed work on the water quality sampling station on the Pulgas Discharge Channel is shown in **Figures 3-10** and **3-11**. The existing sampling station would be detached from the discharge channel and moved to one of the staging areas. Footings for the new steel-frame structure would be excavated using a backhoe and then constructed of concrete. The steel-frame structure would be erected on the footings, and the sampling station would be mounted on the new frame.

Construction at the sampling station site would be completed in about four months during the dry season and would occur concurrently with construction at the LCSD. The construction equipment proposed for use at this site is shown in Table 3.2 and would generally be lighter-duty equipment than that required at the dam site. Only one or two trucks would be needed to convey excavated material to a stockpile or disposal site, and a single ready-mix concrete truck would be needed to form the footings.

3.6.6 Waste Disposal

The proposed construction activities would produce approximately 22,000 cubic yards of excavated material consisting of soil, rock, and organic matter. An estimated 15,400 cubic yards of excavated material would be suitable for use as fill and would be stockpiled at Areas 1 and 4. The remaining 6,600 cubic yards of unusable excavated material would be trucked to an offsite disposal site. Stockpiled material would be used as backfill around the stilling basin and in the



SOURCE. SFPUC, 2008

SFPUC Lower Crystal Springs Dam Improvements

Figure 3-10

Staging and Storage Areas in Sampling Station #5 Vicinity course of proposed construction of the Crystal Springs/San Andreas Transmission Upgrade project. If unused, the stockpiled material would also be trucked to an offsite disposal site.

Demolition at the top and toe of the dam would produce about 1,300 cubic yards of broken concrete. Some of the concrete would be broken to drain-rock size and possibly used to fill depressions in the top of the dam. About 950 cubic yards of broken concrete would be trucked to the landfill or recycled.

The closest disposal sites or transfer stations are located in San Bruno, South San Francisco, San Carlos, and Half Moon Bay, all of which are within 20 miles of the project site. It is not expected that any hazardous waste would be produced at the site, but if it were, the quantity would be small. It would be trucked to the closest hazardous waste disposal site in Kettlemen City, a distance of approximately 300 miles.

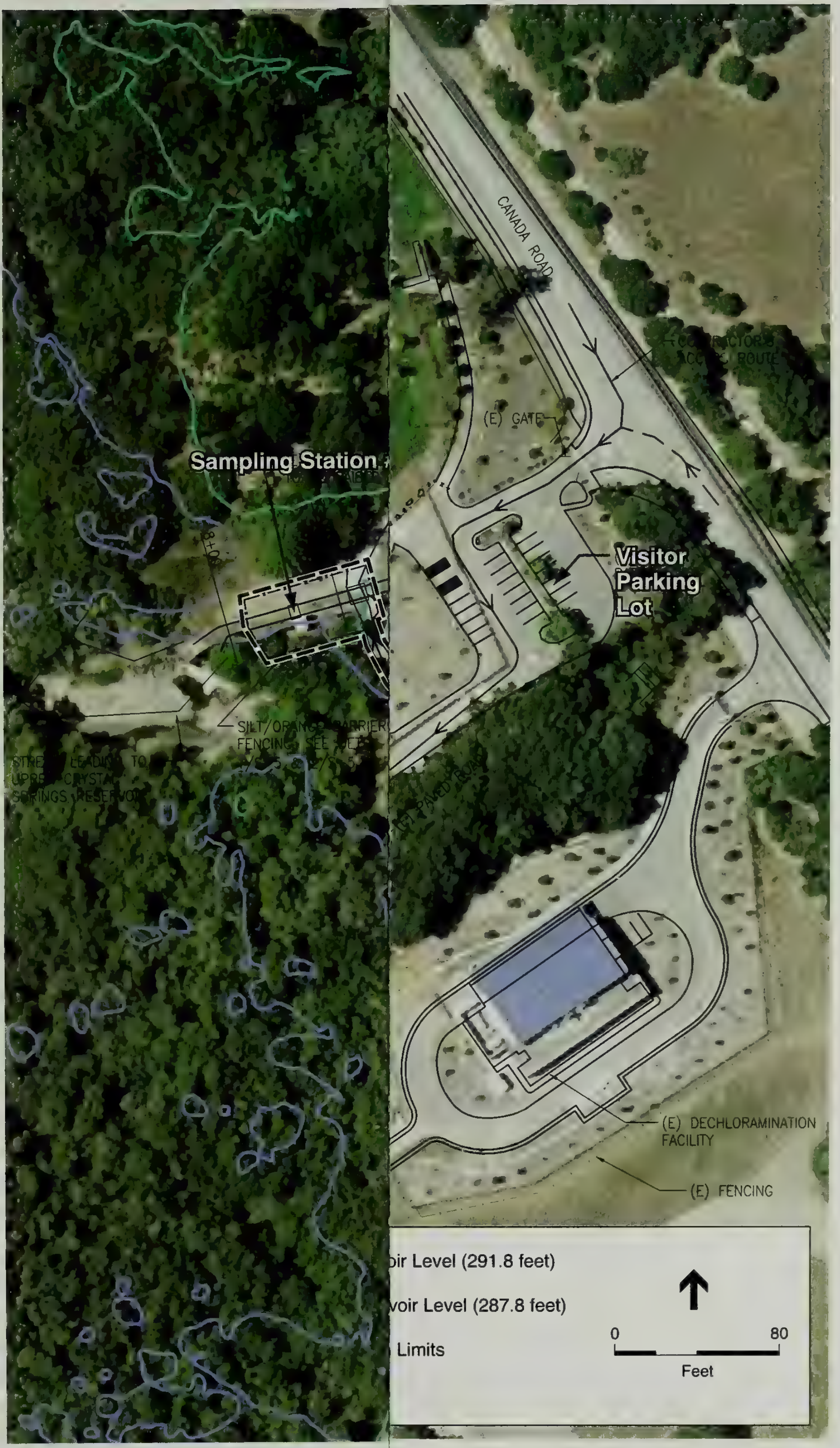
3.6.7 Stormwater Management at the Construction Site

The construction contractor would prepare a Storm Water Pollution Prevention Plan (SWPPP) in accordance with the mitigation measures identified in this EIR (see Chapter 5, Section 5.15, Hydrology and Water Quality) and federal Clean Water Act requirements. The SWPPP would describe how stormwater from the site would be managed during construction. In general, it is expected that the SWPPP would require stormwater to be routed away from unvegetated areas, silt fences to be installed to limit soil erosion, and stormwater containing sediment to be routed to settling basins before discharge to San Mateo Creek (see Chapter 5, Section 5.15, Hydrology and Water Quality, for a more detailed description of the SWPPP).

3.6.8 SFPUC Standard Construction Measures and Greenhouse Gas Reduction Measures

The SFPUC has established Standard Construction Measures (SFPUC, 2007b) for all WSIP projects; these measures would be implemented as part of the proposed project. The main objective of these measures is to reduce impacts on existing resources to the extent feasible. The Standard Construction Measures include activities such as early identification of sensitive environmental resources in the project area and notification of businesses, owners, and residents in areas adjacent to the WSIP projects about the nature, extent, and duration of construction activities. The SFPUC would ensure that the proposed project's contract specifications contain uniform minimum provisions to address these issues. The SFPUC would also implement the following greenhouse gas reduction actions as part of the proposed project. The SFPUC would include the following measures in all LCSDI contractor specifications, which, in addition to having other environmental benefits, would also help reduce greenhouse gas emissions:

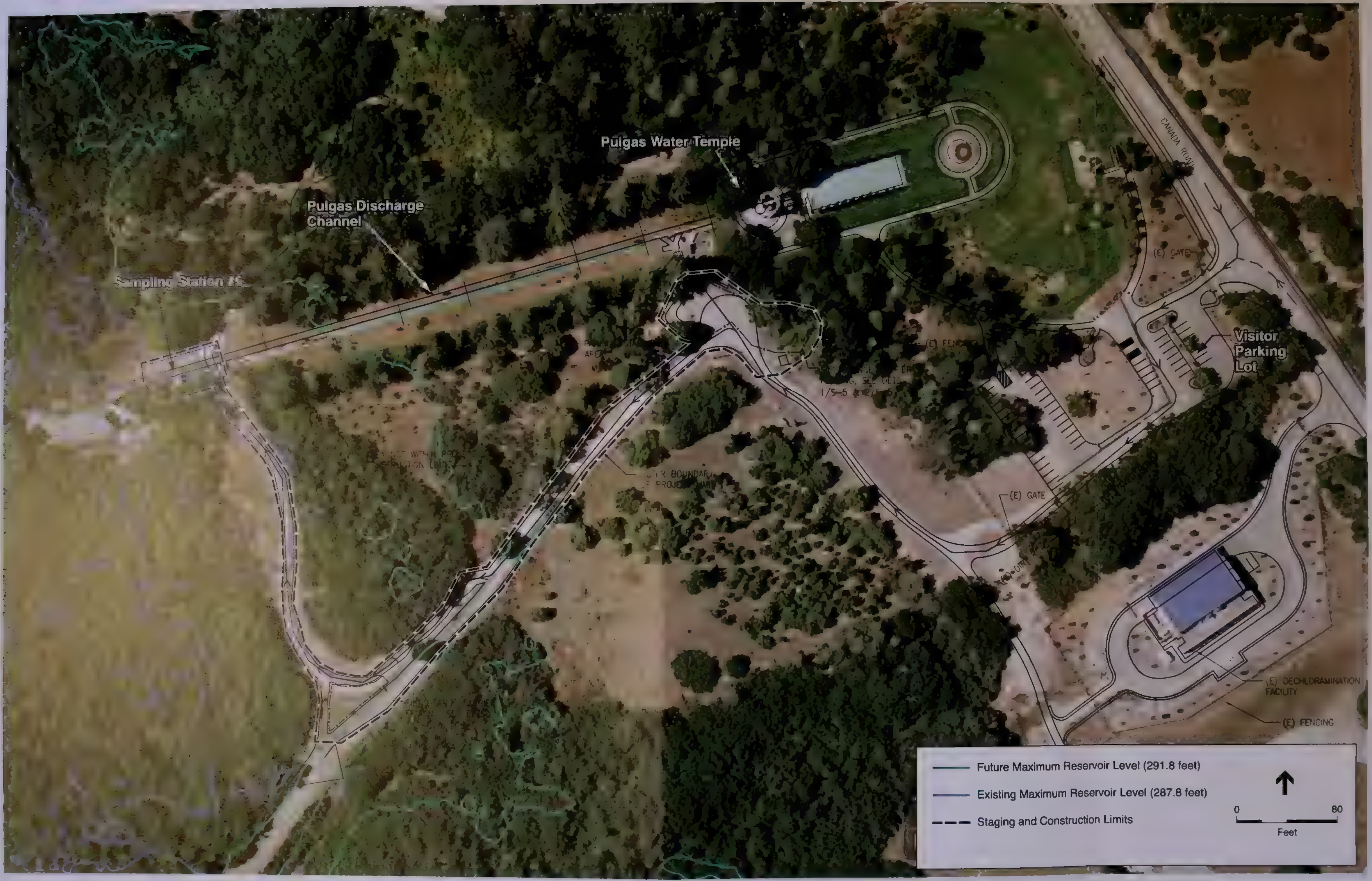
- The SFPUC will require that all contractors maintain tire inflation to the manufacturers' inflation specifications.
- The SFPUC will implement a construction worker education program for the LCSDI project.


CANADA ROAD
CONTRACTOR'S ACCESS ROUTE
(E) GATE
Sampling Station
8+00
Visitor Parking Lot
SILT/ORANGE BARRIER FENCING. SEE DETAIL
STREAM LEADING TO UPPER CRYSTAL SPRINGS RESERVOIR
(E) PAVED ROAD
(E) DECHLORAMINATION FACILITY
(E) FENCING
oir Level (291.8 feet)
voir Level (287.8 feet)
Limits
0
80
Feet

SOURCE: URS; Entrix; ESA + Orion; SFPUC, 2008

SFPUC Lower Crystal Springs Dam Improvements

Figure 3-11
Staging and Storage Areas in Sampling Station #5 Vicinity – Aerial Base


Pulgas Water Temple
Pulgas Discharge Channel
Sampling Station #5
CANADA ROAD
(E) GATE
(E) FENCING
Visitor Parking Lot
OUTER BOUNDARY OF PROJECT LIMIT
(E) GATE
DIRT
(E) DECHLORAMINATION FACILITY
(E) FENCING
Future Maximum Reservoir Level (291.8 feet)
Existing Maximum Reservoir Level (287.8 feet)
Staging and Construction Limits
0
80
Feet

SOURCE: URS, Entrix, ESA + Orion; SFPUC, 2008

SFPUC Lower Crystal Springs Dam Improvements

Figure 3-11
Staging and Storage Areas in Sampling Station #5 Vicinity – Aerial Base

3.7 Operations and Maintenance of Lower Crystal Springs Dam and Crystal Springs Reservoir

3.7.1 Operations during Construction

During the construction period, the SFPUC would continue to operate the reservoir in a manner similar to existing practices, although the ability to release or spill water to San Mateo Creek over the spillway would be interrupted. Because the majority of construction is scheduled for the dry season when there are typically no releases or spills, this interruption is not expected to affect systemwide operations or customer deliveries. More importantly, during the construction period when there is no functioning spillway or stilling basin, the SFPUC would take extreme precaution to prevent any spills over the dam that could threaten the structural integrity of the dam. Thus, reservoir levels during the construction period would be 2 to 4 feet below the current spillway elevation of 283.8 feet to reduce the potential of floodwaters overtopping the dam.

3.7.2 Post-construction Operations

The post-construction operating goals for Crystal Springs Reservoir would be similar to the current goals: the SFPUC would try to keep the reservoir as full as possible without exceeding the maximum normal operating level, to avoid uncontrolled spills (i.e., water over the spillway), and to minimize releases to San Mateo Creek (i.e., controlled releases through the release valves at the dam). However, with the project in place, the maximum normal water surface elevation would be 287.8 feet, 4 feet higher than the current normal maximum of 283.8 feet. As part of the proposed project, the SFPUC would commit to an operational policy that limits the maximum normal water surface elevation to 287.8 feet. Details regarding the SFPUC's proposed operations of Crystal Springs Reservoir following the completion of LCSD improvements are included in Appendix C of this EIR and summarized below.

Post-construction operations of Crystal Springs Reservoir would be similar to current operations, except that the average annual water storage and average annual water surface elevation would both increase. The post-construction average storage would be 17.8 billion gallons, 2.4 billion gallons more than the current DSOD-restricted average storage level of 15.4 billion gallons. The post-construction average annual water surface elevation would be 281.8 feet, 6.6 feet higher than the current average annual elevation of 275.3 feet. During the winter, the SFPUC would continue to keep storage in Crystal Springs Reservoir about 2 billion gallons below the maximum normal storage capacity; this winter flood reservation enables the SFPUC to capture local runoff and prevent flooding.

Seasonal water storage patterns and water surface elevation fluctuations in the future with the proposed project in place are expected to be similar to those in the recent past (since about 2002). The maximum storage and water surface elevation would occur in the spring, and the minimum storage and water surface elevation would occur in the fall. With the proposed project in place, it is expected that the water surface elevation would be between the 286.5- and 274.0-foot contours about 80 percent of the time. This range compares to that under the existing condition, in which the water surface elevation is estimated to range between the 281.5- and 268.0-foot contours 80 percent of the time. Water level fluctuations with the proposed project in place are expected to be about the same as under the existing condition because the overall operating goals would be the same. For more information on the projected future changes in water storage and water surface elevation in Crystal Springs Reservoir, see Chapter 5, Section 5.15, Hydrology and Water Quality.

As it does currently, the SFPUC would allow the reservoir level to exceed the maximum normal water surface elevation occasionally. Under the proposed operations, water surface elevations would exceed 287.8 feet for short durations (up to 14 days) and could reach a high of 291.8 feet during the rainy season (November through April). Such exceedances of the maximum normal water surface elevation would be expected to occur about one year in three, and no more than two to three times in a single year. Exceedances could occur any time during the rainy season, but would primarily occur after March 1 when the SFPUC begins eliminating the winter flood reservation as the rainy season ends.

In extreme and unlikely circumstances (such as a 100-year flood or back-to-back 50-year floods), particularly when the winter flood reservation is not in place, it is possible that the maximum target elevation of 287.8 feet could be exceeded for longer periods, depending on the magnitude and duration of the storm events and the reservoir levels prior to the events. In these extreme circumstances, exceedances above 287.8 feet would be evacuated immediately by:

- Reducing or stopping inflow to Crystal Springs Reservoir from the Hetch Hetchy Aqueduct;
- Pumping up to 75 million gallons per day of water from Crystal Springs Reservoir to San Andreas Reservoir, if capacity is available in the latter;[8] and/or
- Discharging up to 600 cubic feet per second to San Mateo Creek as downstream conditions allow, using pipelines and valves at the LCSD.

The SFPUC operational plan would be to limit controlled releases to San Mateo Creek to once every 10 years on average (SFPUC, 2009d).

During the first three years following the completion of project construction, operations would differ from typical future operations in consideration of habitat requirements of the California red-legged frog and San Francisco garter snake, two special-status species that are present around the perimeter of the reservoir. To allow sufficient time for these species to adapt to the 4-foot increase in maximum normal operating water levels, the SFPUC would gradually increase the water elevations in the reservoir over a period of no less than three years. The maximum normal water surface elevation of the reservoir would increase by 1 foot each year, following an initial increase of 1 foot (to 284.8 feet) on the first April 15 following substantial completion of construction. The following year on April 15, the maximum normal water surface elevation for the reservoir would be 285.8 feet. The following year on April 15, the maximum normal water surface elevation for the reservoir would be 286.8 feet. Finally, no less than three years following completion of the dam improvements, the maximum normal water surface elevation for the reservoir would become 287.8 feet, its long-term value. During this period of no less than three years, the SFPUC would avoid exceedences of the applicable maximum normal water surface elevation. The winter flood reservation would be kept in place later in the spring during the three-year period of interim operations than it would be under the future long-term operating protocols to reduce the risk of a late winter/early spring exceedence of the maximum normal water surface elevation.

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[8] As part of the proposed Crystal Springs/San Andreas Transmission Upgrade project, the SFPUC would increase the pumping capacity from 75 to 120 million gallons per day. See Section 3.8, Coordination with Other Local Projects.

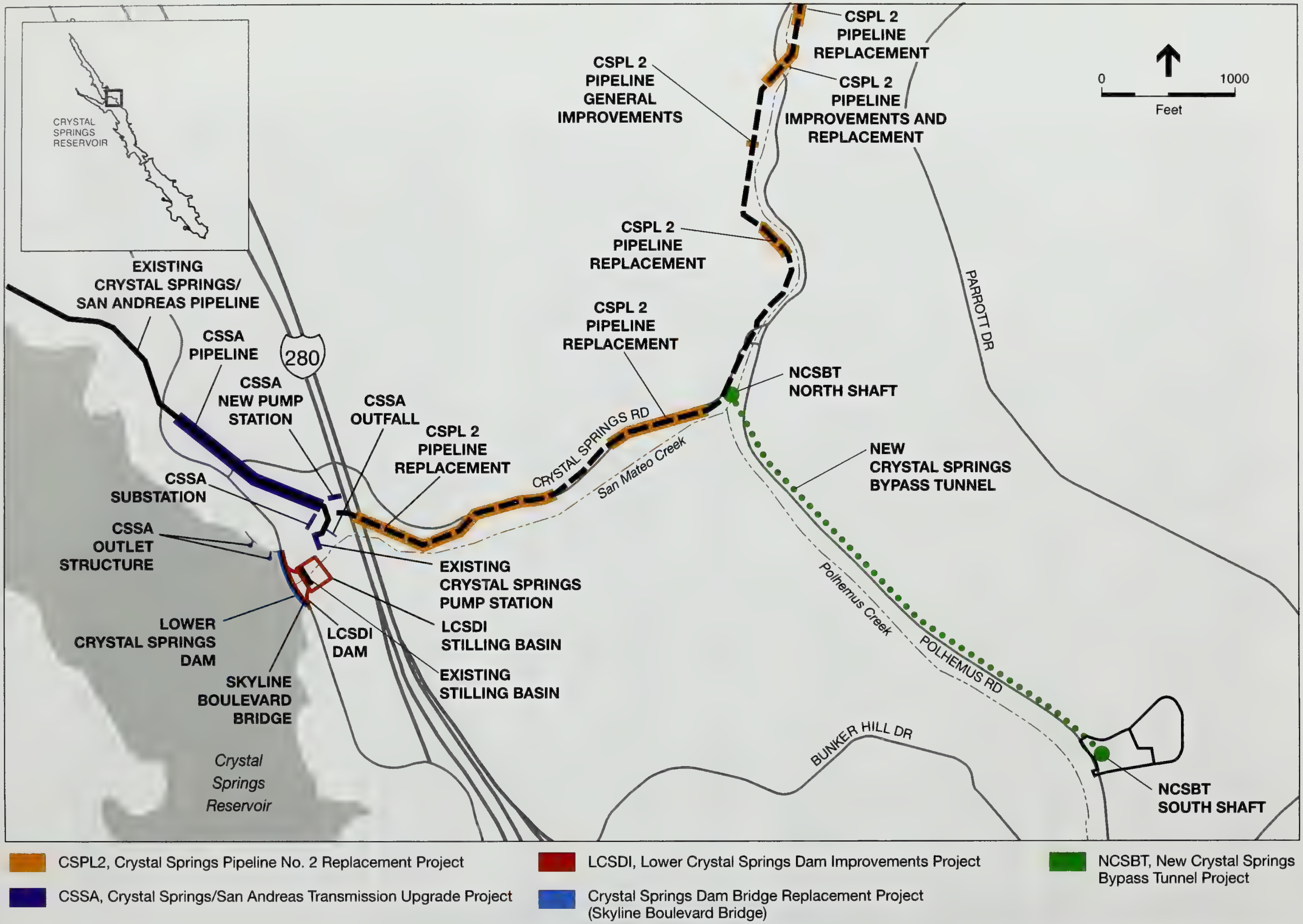
3.7.3 Post-construction Maintenance

Post-construction maintenance activities at the LCSD and Crystal Springs Reservoir would be generally similar to current maintenance activities, but improved access would enable better maintenance of the top of the dam. The SFPUC would maintain and repair structures, including painting and physical repairs as necessary. In addition, the stilling basin would be cleaned twice a year. This maintenance would involve pumping standing water from the stilling basin to a storage tank located away from the creek channel to allow the water to settle before it is released back to San Mateo Creek. All discharges would conform to applicable water quality standards. Sediment and any other debris in the dry basin would be removed and hauled to an approved disposal site (SFPUC, 2009e).

3.8 Coordination with Other Local Projects

Several separate and independent projects are planned and/or proposed to be built in the immediate vicinity of the LCSD, as shown in **Figure 3-12**. These projects, if approved, could affect the design and/or construction of the proposed project and include projects by other agencies or organizations as well as other projects by the SFPUC. The SFPUC is actively coordinating the construction schedule and design of the proposed project to accommodate the potential for other construction projects in the area. The projects that are planned or proposed by other agencies or organizations include:

- **Crystal Springs Dam Bridge (Skyline Boulevard Bridge) Replacement Project, San Mateo County.** San Mateo County is proposing to replace the Skyline Boulevard Bridge (County Bridge No. 67 and also referred to as the Crystal Springs Dam Bridge) because of its deteriorated condition and vulnerability to damage or failure in earthquakes. The bridge traverses the crest of and is supported by the LCSD. The LCSDI and the bridge replacement projects are separate projects with distinct objectives and funding sources, and each would be built irrespective of plans for the other project. However, coordination of design and construction would benefit both San Mateo County and the SFPUC. Uncoordinated design and construction of the two projects would be possible but would greatly increase construction complexity, duration, and cost. The SFPUC has consulted with San Mateo County during the design of the proposed dam improvements, including the location and design of new piers to support the new bridge. The SFPUC and San Mateo County would coordinate construction of the two projects to minimize the time the Skyline Boulevard Bridge would be out of service and traffic diversions would be in place. If the LCSDI project is approved, San Mateo County would stagger construction of the replacement bridge so that the SFPUC's dam improvements could be constructed after demolition of the existing bridge and before construction of the new bridge.


CRYSTAL SPRINGS RESERVOIR
0
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Feet
CSPL 2 PIPELINE REPLACEMENT
CSPL 2 PIPELINE GENERAL IMPROVEMENTS
CSPL 2 PIPELINE IMPROVEMENTS AND REPLACEMENT
CSPL 2 PIPELINE REPLACEMENT
CSPL 2 PIPELINE REPLACEMENT
PARROTT DR
EXISTING CRYSTAL SPRINGS/ SAN ANDREAS PIPELINE
CSSA PIPELINE
280
CSSA NEW PUMP STATION
CSSA OUTFALL
CSPL 2 PIPELINE REPLACEMENT
CRYSTAL SPRINGS RD
San Mateo Creek
NCSBT NORTH SHAFT
NEW CRYSTAL SPRINGS BYPASS TUNNEL
CSSA SUBSTATION
CSSA OUTLET STRUCTURE
EXISTING CRYSTAL SPRINGS PUMP STATION
LCSDI STILLING BASIN
LOWER CRYSTAL SPRINGS DAM
LCSDI DAM
EXISTING STILLING BASIN
SKYLINE BOULEVARD BRIDGE
Polhemus Creek
POLHEMUS RD
BUNKER HILL DR
Crystal Springs Reservoir
NCSBT SOUTH SHAFT
🟧 CSPL2, Crystal Springs Pipeline No. 2 Replacement Project
🟥 LCSDI, Lower Crystal Springs Dam Improvements Project
🟩 NCSBT, New Crystal Springs Bypass Tunnel Project
🟦 CSSA, Crystal Springs/San Andreas Transmission Upgrade Project
🟦 Crystal Springs Dam Bridge Replacement Project (Skyline Boulevard Bridge)

SOURCE: ESA + Orion, 2009.

SFPUC Lower Crystal Springs Dam Improvements

Figure 3-12

Other Projects in the Immediate Vicinity of Lower Crstal Springs Dam

- **Jefferson Martin Transmission Line Segment at Crystal Springs Dam Bridge, Pacific Gas and Electric Company.** PG&E constructed a 230-kilovolt transmission line in 2004, including a temporary overhead segment that currently extends across Crystal Springs Reservoir at the Skyline Boulevard Bridge. Following completion of the replacement Skyline Boulevard Bridge, PG&E intends to replace this line segment by running a new line through electrical conduits proposed to be included in the replacement bridge structure.

Construction of the proposed project would occur in the immediate vicinity of several other SFPUC projects that are listed below. Some of these projects were analyzed in the Program Environmental Impact Report on the WSIP (San Francisco Planning Department, 2008), and the San Francisco Planning Department is currently conducting project-specific environmental review on three of the four projects: the Crystal Springs/San Andreas Transmission Upgrade project, the Crystal Springs Pipeline No. 2 Replacement project, and the Habitat Reserve Program. Project-specific environmental review on the Pulgas Discharge Channel Modifications has been completed, and the SFPUC approved this project in 2008.

- **Crystal Springs/San Andreas Transmission Upgrade.** This WSIP facility improvement project would upgrade the transmission pipeline between Crystal Springs and San Andreas Reservoirs and would involve multiple facility components. The project proposes improvements to the reservoir outlet towers that are directly adjacent to LCSDI Staging Area 5. It also includes replacement of the Crystal Springs Pump Station, the PG&E substation, the south end of the Crystal Springs/San Andreas Pipeline, and an energy dissipation structure in lower San Mateo Creek—all located adjacent to the LCSDI stilling basin enlargement.

- **Crystal Springs Pipeline No. 2 Replacement.** This project would repair and/or replace segments of the Crystal Springs Pipeline No. 2, including the southernmost segment starting at the Crystal Springs Pump Station and continuing along the access road to Crystal Springs Road where proposed staging areas for the LCSDI project are located.

- **Habitat Reserve Program.** This project would preserve, enhance, restore, or create a range of habitats as compensation and mitigation for habitat impacts resulting from implementation of multiple WSIP projects, including the LCSDI project. Several of the Habitat Reserve Program sites are located around the perimeter of Crystal Springs Reservoir and are being planned in coordination with proposed future operations of the reservoir under the proposed project.

- **Pulgas Discharge Channel Modifications.** This project, which the SFPUC authorized on November 12, 2008 in Resolution No. 08-0203, will modify and repair the Pulgas Discharge Channel, and is in the same location as the proposed improvements to Sampling Station #5. This project is currently under construction and is scheduled for completion in 2010.

Chapter 5, Section 5.1, Overview, further describes these and other projects as they relate to potential cumulative environmental effects.

3.9 Required Permits and Approvals

The following approvals from the City and County of San Francisco are required for implementation of the proposed project:

- **San Francisco Planning Commission:** Certifies the Final EIR on the proposed project.
- **San Francisco Public Utilities Commission:** Reviews the certified Final EIR before taking action on the proposed project; adopts CEQA findings and mitigation monitoring and reporting program; decides whether to approve the project.
- **San Francisco Board of Supervisors:** Hears and decides any appeals regarding the Planning Commission's certification of the Final EIR; also appropriates any funding related to implementation of the proposed project.

Prior to construction, the SFPUC would be required to obtain a number of permits and authorizations for the LCSDI project from federal, state, and local agencies. These agencies, permits, and authorizations are listed below:

Federal

- **U.S. Army Corps of Engineers:** Clean Water Act, Section 404 permit; and compliance with and documentation under Section 106 of the National Historic Preservation Act.
- **U.S. Fish and Wildlife Service:** Consultation under Section 7 of the Federal Endangered Species Act, in conjunction with the Section 404 permit.
- **National Marine Fisheries Service:** Consultation under Section 7 of the Federal Endangered Species Act.

State

- **California Department of Water Resources, Division of Safety of Dams:** Dam Alteration Permit.
- **California Regional Water Quality Control Board, San Francisco Bay Region:** National Pollutant Discharge Elimination System General Permit under Section 402 of the Clean Water Act; and Section 401 Water Quality Certification (or waiver) as required when a project receives a Section 404 permit from the U.S. Army Corps of Engineers.
- **California Department of Fish and Game:** Section 1602 Lake and Streambed Alteration Agreement; and California Endangered Species Act Section 2080.1 consultation and consistency determination.
- **State Office of Historic Preservation:** Consultation under Section 106 of the National Historic Preservation Act (in conjunction with Section 404 permit).
- **California Department of Transportation:** Caltrans permit for modification of a Caltrans drain pipe that currently drains into the stilling basin at the toe of the LCSD.

Local

- **San Mateo County:** San Mateo County encroachment permits for potential access to and/or use of Skyline Boulevard.

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CHAPTER 4

Plans and Policies

Sections

4.1 Overview
4.2 Plans and Policies Relevant to the Project
4.3 Plan Consistency Evaluation
4.4 References

4.1 Overview

Pursuant to the California Environmental Quality Act (CEQA) Guidelines Section 15125(d), this chapter describes land use plans and policies and the manner in which they apply to the Lower Crystal Springs Dam Improvement (LCSDI) project (Section 4.2), and then discusses the proposed project's consistency with applicable plans (Section 4.3).

As described in Chapter 3, Project Description, Section 3.9, Required Permits and Approvals, the San Francisco Planning Commission is the agency responsible for certifying the LCSDI project environmental impact report (EIR). The San Francisco Public Utilities Commission (SFPUC) is responsible for making the CEQA findings and deciding whether to approve the project. Plans and policies addressed in this chapter include those pertaining to the City and County of San Francisco (CCSF) as a whole, the SFPUC (as a distinct agency under the CCSF), and other federal, state, and local agencies. The plans and polices reviewed in this chapter are listed below:

- **City and County of San Francisco.** San Francisco General Plan, Accountable Planning Initiative, San Francisco Sustainability Plan, and San Francisco Municipal Green Building Program.

- **SFPUC.** Peninsula Watershed Management Plan and Peninsula Watershed Habitat Conservation Plan (required under the Peninsula Watershed Management Plan); Water Enterprise Environmental Stewardship Policy; and Right of Way Integrated Vegetation Management Policy.

- **Federal and State Agencies.** Golden Gate International Biosphere Reserve Designation, Golden Gate National Recreation Area Scenic Easement and Scenic and Recreation Easement, and California Department of Fish and Game (CDFG) Game Refuge Designation.

- **Local Agencies.** San Mateo County General Plan, San Mateo County Trails Plan, and San Mateo County Bicycle Plan.

Permit requirements are also described in Chapter 3, Section 3.9, Required Permits and Approvals. In some cases, these include permits to be obtained from local jurisdictions for specific activities or to comply with specific ordinances. The pertinent resource-specific plans are described and reviewed in Chapter 5, Environmental Setting, Impacts, and Mitigation Measures, Sections 5.2 through 5.18 of this EIR. For example, the regional Bay Area 2005 Ozone Strategy and the San Francisco Climate Action Plan are discussed in Section 5.8, Air Quality.

4.2 Plans and Policies Relevant to the Project

4.2.1 City and County of San Francisco Plans and Policies

As shown in Chapter 3, Figure 3.1, the proposed project is located in unincorporated San Mateo County. The CCSF land use plans and policies are primarily applicable to projects within the jurisdictional boundaries of San Francisco, although in some cases they may apply to projects outside of San Francisco, such as the LCSDI project. The SFPUC is guided by the San Francisco City Charter along with other City plans and policies. These plans include the San Francisco General Plan, which sets forth the comprehensive, long-term land use policy for San Francisco; the San Francisco Sustainability Plan, which addresses the long-term sustainability[1] of the city; and the San Francisco Municipal Green Building Program, which establishes green building standards for municipal projects. In addition, the SFPUC has adopted various plans and policies that further direct its activities, including the Peninsula Watershed Management Plan, Water Enterprise Environmental Stewardship Policy, and Right of Way Integrated Vegetation Management Policy.

4.2.1.1 Extraterritorial Lands

The CCSF has authority (San Francisco City Charter, Section 4.112) over the management, use, and control of land it owns outside of San Francisco, subject to the SFPUC's exclusive charge of the construction, management, use, and control of the city's water supplies and utilities (San Francisco City Charter, Section 8B.121). Accordingly, the CCSF relies on its own plans and policies with respect to extraterritorial lands, as applicable.

California Government Code Sections 53090 et seq. provide that the SFPUC receives intergovernmental immunity from the zoning and building laws of other cities and counties. The SFPUC, however, seeks to work cooperatively with local jurisdictions where CCSF-owned facilities are sited outside of San Francisco to avoid conflicts with local land use plans and building and zoning codes. Also, the SFPUC is required under Government Code Section 65402(b) to inform local governments of its plans to construct projects or acquire or dispose of its extraterritorial property. The local governments have a 40-day review period to determine project consistency with their general plans. Under this requirement, the cities' or counties' determinations of consistency are advisory to the SFPUC rather than binding.

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[1] Sustainability or sustainable development can be defined as development that meets the needs of the present without compromising the ability of future generations to meet their needs.

4.2.1.2 San Francisco General Plan

The San Francisco General Plan (CCSF, 1988), as amended, sets forth the comprehensive, long-term land use policies for San Francisco. One of the basic goals of the general plan is "coordination of the growth and development of the city with the growth and development of adjoining cities and counties and of the San Francisco Bay Region." The general plan consists of 10 issue-oriented plan elements: Air Quality, Arts, Commerce and Industry, Community Facilities, Community Safety, Environmental Protection, Housing, Recreation and Open Space, Transportation, and Urban Design. General plan elements and their respective goals that may be relevant to the proposed project are briefly described below.

- **Air Quality Element.** This element promotes the goal of clean air planning through objectives and policies aimed at adhering to air quality regulations.
- **Commerce and Industry Element.** This element serves as a guide for decisions related to economic growth and change in San Francisco. The three goals of the element are: continued economic vitality; social equity (with respect to employment opportunities); and environmental quality. These goals address general citywide objectives, as well as objectives for each of the major sectors of San Francisco's economy.
- **Community Safety Element.** This element addresses the potential for geologic, structural, and nonstructural hazards to affect city-owned structures and critical infrastructure. The goal of this element is to protect human life and property from hazards.
- **Environmental Protection Element.** This element addresses the impact of urbanization on the natural environment. The element promotes the protection of plant and animal life and freshwater sources and speaks to San Francisco's responsibility to provide a permanent, clean water supply to meet present and future needs and to maintain an adequate water distribution system.
- **Urban Design Element.** This element promotes the preservation of landmarks and structures with notable historic, architectural, or aesthetic value, and seeks to balance development with its natural environmental and visual features.
- **Recreation and Open Space Element.** This element contains objectives and policies related to maintaining, creating, and enhancing recreational and open space resources. Although this element promotes public access to portions of SFPUC watershed lands that have high recreational value, the element acknowledges the need to restrict certain recreational uses to protect water quality.

4.2.1.3 Accountable Planning Initiative

In November 1986, the voters of San Francisco approved Proposition M, the Accountable Planning Initiative, which added Section 101.1 to the Planning Code to establish eight Priority Policies as a preamble to the San Francisco General Plan. These Priority Policies are included in the preamble to the general plan and serve as the basis upon which inconsistencies in the general plan are resolved. The Priority Policies state that:

1. Neighborhood-serving retail uses shall be preserved and enhanced and future opportunities for resident employment in and ownership of such businesses enhanced.
2. Housing and neighborhood character shall be conserved and protected in order to preserve the cultural and economic diversity of the neighborhoods.
3. The City's supply of affordable housing shall be preserved and enhanced.
4. Commuter traffic shall not impede the Muni transit service or overburden streets or neighborhood parking.
5. A diverse economic base shall be maintained by protecting industrial and service sectors from displacement by commercial office development, and future opportunities for resident employment and ownership in these sectors enhanced.
6. The City shall achieve the greatest possible preparedness to protect against injury and loss of life in an earthquake.
7. Landmarks and historic buildings shall be preserved.
8. Parks and open space and their access to sunlight and vistas shall be protected from development.

In accordance with the Accountable Planning Initiative, the CCSF is required to find that a proposed project is consistent with the Priority Policies established by Proposition M prior to issuing a permit for the project, adopting legislation that requires an Initial Study under CEQA, adopting any zoning ordinance or development agreement, and taking any action that requires a finding of consistency with the San Francisco General Plan.

4.2.1.4 Sustainability Plan for San Francisco

The San Francisco Board of Supervisors endorsed the Sustainability Plan (CCSF, 1997) in 1997, although the Board has not committed the CCSF to perform the actions addressed in the plan. The plan serves as a blueprint for sustainability, with many of its individual proposals requiring further development and public comment. The plan's underlying goals are to maintain the physical resources and systems that support life in San Francisco and to create a social structure that will allow such maintenance. It is divided into 15 topic areas. Ten of these address specific environmental issues: air quality; biodiversity; energy; climate change and ozone depletion; food and agriculture; hazardous materials; human health; parks; open spaces and streetscapes; solid waste; transportation; and water and wastewater. Five are broader in scope and cover many issues, including the economy and economic development; environmental justice; municipal expenditures; public information and education; and risk management. Each topic area has a set of indicators that is to be used over time to determine whether San Francisco is moving in a direction that supports sustainability for each particular area.

4.2.1.5 San Francisco Municipal Green Building Program

San Francisco's Green Building Program was founded in 1999 when the CCSF adopted the Resource Efficient Building Ordinance, which established green building standards for municipal buildings to increase energy efficiency, conserve CCSF finances, create safe workplaces for CCSF employees and visitors, and reduce the environmental impacts of demolition, construction, and operation of buildings. The ordinance created the interdepartmental Resource Efficient Building (REB) Task Force and charged the San Francisco Department of the Environment with implementing the ordinance in partnership with the Department of Public Works and other REB Task Force departments. In 2004, amendments to Chapter 7 of the Environment Code set Leadership in Energy and Environmental Design (LEED) Silver Certification by the U.S. Building Council as the minimum environmental performance requirement for all municipal projects over 5,000 square feet. The REB Task Force assists City departments in complying with the LEED Silver Certification requirement and helps to determine which projects are applicable for LEED ratings. For all municipal construction projects, including those projects that do not involve buildings and are not required to obtain LEED Silver Certification, the REB Task Force provides recommended best practices and sample specifications for building materials, such as recycled steel and concrete (CCSF, 2004–2007).

4.2.2 SFPUC Plans and Policies

4.2.2.1 Peninsula Watershed Management Plan

The Peninsula watershed encompasses 23,000 acres of CCSF-owned lands in San Mateo County located generally west of Interstate 280 (I-280) and within the drainage areas of Pilarcitos, San Mateo, and San Andreas Creeks. The SFPUC adopted a watershed management plan for the Peninsula watershed to provide a policy framework for the SFPUC to make decisions about activities that are appropriate on watershed lands. All of the project and its related components are located within the boundaries of the SFPUC Peninsula watershed and would be governed by policies set forth in the Peninsula Watershed Management Plan (SFPUC, 2002). The SFPUC Peninsula Watershed Management Plan (WMP) provides goals, policies, and management actions that address watershed activities and reflect the unique qualities of the watershed. The Peninsula WMP is also intended for use by the SFPUC as watershed management implementation guidelines. SFPUC watershed lands are managed by the SFPUC, Natural Resources Division, Land and Resource Management Section.

As part of implementation of the Peninsula WMP, the SFPUC reviews all plans, projects, and activities that occur within the Peninsula watershed for conformity with the management plans as well as for compliance with environmental codes and regulations. To accomplish this, the SFPUC has established a project review team with members from various SFPUC departments as well as the San Francisco City Attorney's Office. Appropriate SFPUC personnel review proposals for new facilities, structures, roads, trails, projects, and leases or for improvements to existing facilities. Projects subject to this review include those that involve construction, digging or earthmoving, clearing, installation of facilities, use of hazardous materials, or other disturbance to watershed resources. In addition, projects that involve the issuance of new or revised leases and permits are subject to this review procedure. The SFPUC also coordinates project review on an annual basis with the Golden Gate National Recreation Area (discussed below) under a planning Memorandum of Understanding.

The SFPUC considers water quality protection to be the first and foremost goal for its watershed lands. The goals and policies of the Peninsula WMP are organized around the primary goal of water quality protection and six secondary goals pertaining to water supply, natural resources, watershed protection, land use compatibility, fiscal management, and public awareness. The primary and secondary goals are as follows:

- *Primary Goal*: Maintain and improve source water quality to protect public health and safety.
- *Secondary Goals*:
  - Maximize water supply
  - Preserve and enhance the ecological and cultural resources of the watershed
  - Protect the watershed, adjacent urban areas, and the public from fire and other safety hazards
  - Continue existing compatible uses and provide opportunities for potential compatible uses on watershed lands, including educational, recreational, and scientific uses
  - Provide a fiscal framework that balances financial resources, revenue-generating activities, and overall benefits and an administrative framework that allows implementation of the WMPs
  - Enhance public awareness of water quality, water supply, conservation, and watershed protection issues

One of the management actions under the Peninsula WMP is the development of a comprehensive, multi-species habitat conservation plan (HCP) for the species of concern on the watershed. A HCP provides long-term conservation measures for species listed as threatened or endangered under the California and Federal Endangered Species Acts or for species that could be listed in the future. The SFPUC plans to develop an HCP in compliance with federal and state regulations for the Peninsula watershed. It is anticipated that the Peninsula Watershed HCP will identify specific species as well as describe SFPUC watershed operations and maintenance activities to be covered under the plan. The HCP will identify conservation programs to provide long-term protection of covered species by protecting biological communities in the watershed. The Peninsula Watershed HCP must undergo environmental review in compliance with CEQA before it can be adopted by the SFPUC. However, at this the SFPUC has not yet determined when it will be developing the HCP. Therefore, this plan is not discussed further in this EIR.

4.2.2.2 Water Enterprise Environmental Stewardship Policy

Adopted in June 2006, the Water Enterprise Environmental Stewardship Policy established the long-term management direction for CCSF-owned lands and natural resources affected by operation of the SFPUC regional water system within the Tuolumne River, Alameda Creek, and

Peninsula watersheds (SFPUC, 2006). It also addresses rights-of-way and properties in urban surroundings under SFPUC management. The policy includes the following:

- The SFPUC will proactively manage the watersheds under its responsibility in a manner that maintains the integrity of the natural resources, restores habitats for native species, and enhances ecosystem function.
- To the maximum extent practicable, the SFPUC will ensure that all operations of the SFPUC water system (including water diversion, storage, and transport); construction and maintenance of infrastructure; land management policies and practices; purchase and sale of watershed lands; and lease agreements for watershed lands protect and restore native species and the ecosystems that support them.
- It is the policy of the SFPUC to operate the regional water system in a manner that protects and restores native fish and wildlife downstream of SFPUC dams and water diversions, within SFPUC reservoirs, and on SFPUC watershed lands.
- Releases from SFPUC reservoirs will mimic the variation of the seasonal hydrology (e.g., magnitude, timing, duration, and frequency) of their corresponding watersheds in order to sustain the aquatic and riparian ecosystems upon which these native fish and wildlife species depend (consistent with the SFPUC mission, existing agreements, and applicable state and federal laws).
- The SFPUC will actively monitor the health of the terrestrial and aquatic habitats, both under SFPUC ownership and affected by SFPUC operations, in order to continually improve ecosystem health.
- The SFPUC will manage rights-of-way and properties in urban surroundings under its management in a manner that protects and restores habitat value where available and encourages community participation in decisions that significantly interrupt or alter current land uses in these parcels.

The implementation strategies of the Stewardship Policy that are relevant to the LCSDI project include: (1) implementing and updating the Peninsula WMP; (2) developing conservation plans for the Peninsula watershed (described below); (3) developing and implementing the Watershed and Environmental Improvement Program that includes the Peninsula watershed; (4) integrating this policy into the Water System Improvement Program (WSIP) and individual infrastructure projects, including the proposed project; and (5) ensuring the policy guides the development of the project description, alternatives, and mitigation for SFPUC projects during environmental review.

4.2.2.3 Right of Way Integrated Vegetation Management Policy

In February 2007, the SFPUC adopted the Right of Way Integrated Vegetation Management Policy (SFPUC, 2007) to manage vegetation that poses a threat or hazard to the regional water system's operation, maintenance, and infrastructure throughout the SFPUC water distribution and collection systems. Specific elements of the Vegetation Management Policy address the management and removal of vegetation (including trees, annual grasses, and weeds) within the SFPUC right-of-way as well as on land leased or permitted by the SFPUC. The policy focuses primarily on water transmission and pipeline facilities; however, it also states that vegetation of any size or species will not be allowed to grow within certain critical portions of the right-of-way, pumping stations, or other facilities, as determined by a qualified professional. The Vegetation Management Policy provides guidance for emergency, priority, and standard vegetation removal. It also includes provisions for notifying local jurisdictions 10 days before the start of work and for notifying residents within 300 feet of the site where vegetation removal is proposed. Fire danger within the SFPUC right-of-way is also a concern, and the SFPUC is required to comply with local fire ordinances, which specify that existing vegetation be identified, reduced, and managed to prevent potential disruption of fire protection services. The Vegetation Management Policy also seeks to reduce and eliminate, to the degree practicable, the use of herbicides on vegetation within the right-of-way.

4.2.3 Federal and State Land Use Plans and Policies

4.2.3.1 Golden Gate International Biosphere Reserve Designation

The Peninsula watershed is one of 13 areas that comprise the Golden Gate National Recreation Area (GGNRA), which was designated an International Biosphere Reserve in 1988 by the United Nations Educational, Scientific, and Cultural Organization (UNESCO). International Biosphere Reserves are intended to fulfill three basic functions, including: (1) conservation of important biological resources; (2) development of environmentally sound economic growth; and (3) support for research, monitoring, education, and information exchange related to conservation issues. International Biosphere Reserves are under the jurisdiction of the countries in which they are situated. Some countries have enacted legislation specifically to establish Biosphere Reserves, while in other countries they simultaneously include areas protected under other systems (such as national parks or nature reserves). The Golden Gate Biosphere Reserve is managed by the National Park Service (NPS) and operates under the NPS policies and guidelines in accordance with a General Management Plan, which is currently being revised. However, the SFPUC retains its right to carry out the actions necessary for the collection, storage, and transmission of water and the protection of water quality for human consumption on SFPUC Peninsula watershed lands.

4.2.3.2 U.S. Department of the Interior, GGNRA Scenic Easement and Scenic and Recreation Easement

In 1969, the CCSF granted two easements—a Scenic Easement and a Scenic and Recreation Easement—to the U.S. Department of the Interior over the vast majority of the 23,000-acre Peninsula watershed. Crystal Springs Reservoir and water quality sampling station #5 lie within the Scenic Easement. The Lower Crystal Springs Dam and staging areas on Skyline Boulevard are located along the eastern border of the Scenic Easement. The stilling basin and staging and storage areas at the toe of the dam are not within either easement, but these areas are bordered by the Scenic and Recreation Easement on the north and south and by the Scenic Easement on the west. The easements, administered by the Golden Gate National Recreation Area (GGNRA), were granted to obtain a change in the alignment of I-280 to a less environmentally damaging location farther east of Crystal Springs Reservoir, and to increase the federal share of project costs. The

Scenic and Recreation Easement includes approximately 4,000 acres of land in the vicinity of I-280. Limited public access is allowed within the Scenic and Recreation Easement. The approximately 19,000-acre Scenic Easement covers the lands west of the Crystal Springs and San Andreas Reservoirs; public access is generally not permitted within the Scenic Easement [guided hikes are permitted]. The easements place restrictive covenants on the use of lands that are unrelated to the SFPUC's overall management of the watershed for utility purposes.

4.2.3.3 California Department of Fish and Game, Fish and Game Refuge Designation

In 1931, at the request of the SFPUC (then the San Francisco Water Department), the California Department of Fish and Game (CDFG) designated the Peninsula watershed as a state fish and game refuge under the control and enforcement of the CDFG. Under Section 10500 et seq. of the Fish and Game Code, the watershed is a designated refuge for both fish and game (birds and mammals), and the unauthorized "taking" of birds or mammals or the use of firearms (or other weapons for the purpose of taking birds or mammals) are generally prohibited in the Peninsula watershed without specific authorization. However, Section 10654 of the Fish and Game Code specifically states that none of the provisions of the refuge designation "prevents the full use of land included in the San Francisco Fish and Game Refuge for water supply purposes, nor prohibits any authorized employee of the San Francisco Water Department from carrying out such reasonable measures as may be necessary for the protection of the water supply or the prevention of pollution of the streams or reservoirs."

4.2.4 Local Land Use Plans and Policies

The proposed project is located on extraterritorial lands owned by the CCSF in unincorporated San Mateo County. This section describes the local land use plans and policies of San Mateo County and of the City/County Association of Governments (C/CAG) of San Mateo County that are relevant to the proposed project.[2] Although the SFPUC is not legally bound by the land use plans and policies of other jurisdictions, non-CCSF land use plans are discussed in this section to the extent that they provide land use planning information for the jurisdictions in which the project is located. This information is relevant to evaluate the impacts of the proposed project with respect to the specific significance criteria under CEQA that require an analysis of the compatibility of a proposed project with certain aspects of local land use plans and policies adopted for the purpose of avoiding or mitigating an environmental effect. These particular significance criteria are listed below, along with the location in Chapter 5 of this EIR where the reader can find the impact evaluation.

- Result in the loss of availability of a locally important mineral resource recovery site delineated in a local general plan, specific plan, or other land use plan (not applicable, see Section 5.1.1, Scope of Analysis).

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[2] The proposed project is adjacent to the local planning areas of Hillsborough (Town of Hillsborough, *General Plan*, March 2005) and San Mateo (City of San Mateo, *Vision 2010 San Mateo General Plan*, 1996). However, it is not within the jurisdictional boundaries of these communities, and these plans are not discussed.

- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance (analyzed in Section 5.13, Biological Resources)
- Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan (analyzed in Section 5.13, Biological Resources)
- Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., conflict with policies promoting bus turnouts, bicycle racks, etc.), or cause a substantial increase in transit demand that cannot be accommodated by existing or proposed transit capacity or alternative travel modes (analyzed in Section 5.6, Transportation and Circulation)
- Expose people to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies (analyzed in Section 5.7, Noise and Vibration).
- For a project located within an area covered by an airport land use plan (or, where such a plan has not been adopted, within two miles of a public airport or public use airport), expose people residing or working in the project area to excessive noise levels (not applicable, see Section 5.7, Noise and Vibration)
- Conflict with existing zoning for agricultural use or a Williamson Act contract (not applicable, see Section 5.18, Agricultural Resources)[3]

4.2.4.1 San Mateo County General Plan

The following factors listed below affect the application of the San Mateo County General Plan (San Mateo County, 1986) to the proposed project.

Local Agency Project Approval

Elements of the LCSDI project would require an encroachment permit for construction activities located along Skyline Boulevard.

Building and Zoning Ordinances

Building and zoning ordinances represent the most specific expressions of general plan goals, objectives, and policies. As described above in Section 4.2.1, state law and judicial interpretations of state law (California Government Code Section 53090 et seq.) mutually exempt cities and counties from complying with each other's building and zoning ordinances. The SFPUC, which is a part of the CCSF, is therefore exempt from complying with the building and zoning ordinances of other cities and counties. In addition, Water Code Section 6026 provides that no city or county has the authority to regulate, supervise, or provide for the regulation or supervision of any dam or reservoir in California that is under the jurisdiction of the California Department of Water

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[3] Under a Williamson Act (Land Conservation Act of 1965) contract, the landowner agrees to limit the use of the land to agriculture and compatible uses for a period of at least 10 years. In return, the land is taxed at a rate based on the agricultural production of the land, rather than its real estate market value.

Resources, Division of Safety of Dams; the State of California has exclusive jurisdiction over the construction and operation of jurisdictional dams such as Lower Crystal Springs Dam.

Local Government Notification and Consistency Determination Requirements

California Government Code Section 65402(b) requires that the SFPUC inform cities and counties of its plans to construct projects or acquire or dispose of extraterritorial property within its jurisdiction. The local governments then have 40 days to determine if the project is consistent with their general plans; these consistency determinations are advisory to the SFPUC rather than binding. Prior to project implementation, local jurisdictions would be notified pursuant to Government Code Section 65402(b). Notwithstanding the above, where CCSF-owned facilities are sited outside of San Francisco, the SFPUC seeks to work cooperatively with local jurisdictions to avoid conflicts with local land use plans and building and zoning codes.

The San Mateo County General Plan governs land use planning and development in unincorporated San Mateo County, which encompasses over 30,000 acres of urban, rural, and permanent open space. The general plan seeks to recognize and balance the different land use patterns, infrastructure needs, and circulation patterns of these various land uses while balancing the need to preserve San Mateo County's open space, natural resources, and agricultural lands.

The San Mateo County General Plan recognizes the Peninsula watershed as a unique area that should be protected and retained for open space, wildlife, water supply, and recreational uses. The plan calls for continued cooperative agreements among the County, CCSF, State of California, and GGNRA for management of the watershed.

The San Mateo County General Plan contains 16 elements that seek to balance and maintain open space and rural and urban development within the county. The general plan supports the preservation of natural resources, including biological, historic, and visual resources. Lower Crystal Springs Dam is listed in the general plan's preliminary inventory of historic resources, which is discussed in detail in Section 5.5, Cultural and Paleontological Resources. The general plan encourages the replacement of vegetation and trees removed during construction. Section 5.13, Biological Resources, discusses the tree removal and replacement requirements of the San Mateo County Significant Tree Ordinance. Section 5.3, Aesthetics, discusses the temporary and long-term visual impacts of the proposed project. The general plan encourages the placement of utilities underground to decrease visual impacts, and recognizes the need to develop critical public facilities, such as water supply, that can accommodate emergencies without resulting in significant service interruptions. Policies pertaining to natural hazards address the protection of public utilities from the effects of natural disasters. The general plan addresses the use of noise-reduction techniques during construction, as well as protection from human health hazards (e.g., construction-related exhaust emissions). The plan discusses the need to minimize traffic congestion on recreational access routes, and encourages the development of multi-use recreation trails under the management of other public agencies. The general plan also contains goals and objectives that promote the reduction of solid waste and encourage the reuse of recycled materials.

Within the project vicinity, the San Mateo County General Plan designates Skyline Boulevard (Highway 35) from Highway 92 to the Santa Clara County line and Crystal Springs Road as a scenic route. Based on San Mateo County's application to Caltrans for scenic highway approval, Skyline Boulevard is also a state-designated scenic route under the California Scenic Highway Program. Designated scenic routes are addressed in detail in Section 5.3, Aesthetics.

4.2.4.2 San Mateo County Trails Plan

The San Mateo County Trails Plan, last updated in 2001, is the primary planning document for a coordinated system of trails throughout San Mateo County. The plan includes Trail Policies that set standards for implementation of the plan; Design Guidelines that specify the parameters for siting, designing, and constructing new trails; and Use and Management Guidelines that specify how individual trails should be maintained. The parks and recreation policies of the San Mateo County General Plan are incorporated by reference into the trails plan (San Mateo County Parks and Recreation Commission, 2001).

4.2.4.3 San Mateo County Comprehensive Bicycle Route Plan

The San Mateo County Comprehensive Bicycle Route Plan, an Element of the Countywide Transportation Plan, was developed by the City/County Association of Governments (C/CAG) of San Mateo County in association with its member agencies, which are comprised of the County and 20 incorporated areas. The bicycle route plan is intended to coordinate all bicycle-related plans, programs, and projects within the county and establish a set of policies, goals, and objectives to guide member agencies in implementation of bicycle projects (C/CAG of San Mateo County, 2000). Current bikeway classifications in the project area are identified in the 2009 San Mateo County Bicycle Maps (C/CAG of San Mateo County, 2009).

4.3 Plan Consistency Evaluation

The evaluation of plan consistency is based on the applicability of relevant land use plans and policies to the project as they relate to:

- The underlying goals of the San Francisco General Plan and Sustainability Plan and the principal goals of the SFPUC Peninsula WMP and Water Enterprise Environmental Stewardship Policy, Right of Way Integrated Vegetation Management Policy, and requirements of the Municipal Green Building Program

- Federal and state land use plans and policies applicable to the project (e.g., by means of the NPS Golden Gate Biosphere Reserve designation, GGNRA easements, and CDFG refuge designation)

- Plans and policies of local jurisdictions

For these plans, a determination of consistency is made, below, as required by Section 15125(d) of the CEQA Guidelines. However, because the policy language found in a land use plan is susceptible to varying interpretations, it is often difficult to determine whether a proposed project is consistent or inconsistent with such policies. Furthermore, because land use plans often contain numerous policies emphasizing differing legislative goals, a project may be consistent with a general plan, taken as a whole, even though it may appear to be arguably inconsistent with specific policies within the plan. The board or commission that enacted the plan or policy generally determines the meaning of such policies; these interpretations prevail if they are "reasonable," even though other reasonable interpretations are also possible. In light of these considerations, the consistency evaluation in this EIR represents the best attempt to advise the decision-makers as to whether the project is consistent with applicable land use plans and policies. Direct and indirect physical impacts resulting from project implementation are not addressed in this chapter, but in the appropriate technical sections in Chapter 5 of the EIR.

As stated above, the San Francisco General Plan and Sustainability Plan are primarily applicable to projects located in San Francisco; however, they may also be applicable to projects on SFPUC extraterritorial land.

The project's consistency with plans and policies of San Francisco, the SFPUC, federal and state agencies, and San Mateo County is discussed below.

4.3.1 Consistency with San Francisco Plans and Policies

4.3.1.1 San Francisco General Plan

The San Francisco General Plan sets forth the CCSF's comprehensive, long-term land use policy and, as such, is primarily applicable to projects within its jurisdictional boundaries. The proposed project, which is located outside the CCSF boundaries, involves improvements to the Lower Crystal Springs Dam to comply with requirements of the California Department of Water Resources, Division of Safety of Dams (DSOD) and to restore the historical storage capacity of Crystal Springs Reservoir. In addition, as an ancillary project component, a water quality sampling station located at the Pulgas Discharge Channel would be raised to accommodate the proposed changes in reservoir operations and associated increase in water surface elevations. Thus, the project would support the health and safety of the communities in the project area as well as the health and safety of SFPUC water customers. The project would not affect land uses within the boundaries of the CCSF and, overall, would be consistent with the spirit and intent of the San Francisco General Plan.

Any conflict between the project and San Francisco General Plan policies that relates to physical environmental issues are discussed in Chapter 5, Environmental Setting, Impacts, and Mitigation Measures. The compatibility of the project with San Francisco General Plan policies that do not relate to physical environmental issues will be considered by decision-makers as part of their decision whether to approve or disapprove the proposed project. Any potential conflicts identified as part of the process would not alter the physical environmental effects of the proposed project.

4.3.1.2 San Francisco Priority Policies

Of the eight Priority Policies, only Policy 7(concerning preservation of landmarks and historic buildings) would be relevant to the proposed project. The other policies are not relevant because the project would be constructed outside of San Francisco; would be located away from San Francisco neighborhoods; would have no effect on nor create the need for affordable housing; would not result in any commuter automobiles; would not result in commercial office development; does not directly involve seismic upgrades; and would have no long-term effects on open space. Implementation of mitigation measures identified in Section 5.5, Cultural and Paleontological Resources, would minimize potential impacts on historic resources, but there would still be a significant and unavoidable adverse impact on Lower Crystal Springs Dam as a historic resource and a significant and unavoidable, adverse, cumulative impact on historic resources due to effects on Lower Crystal Springs Dam in conjunction with effects on Crystal Springs Outlet Structure 1 that would occur under the SFPUC's Crystal Springs/San Andreas Transmission Upgrade project. Therefore, the proposed project would not be consistent with Policy 7 concerning historic resources. In accordance with the Accountable Planning Initiative, decision-makers would consider and balance this inconsistency with how the project, on the whole, meets the overall objectives of the San Francisco General Plan.

4.3.1.3 San Francisco Sustainability Plan

The San Francisco Sustainability Plan was developed for the purpose of addressing San Francisco's long-term environmental sustainability. The proposed project would support the goals of the Sustainability Plan, because it would improve the water service reliability of the SFPUC regional water system for people in San Francisco and on the Peninsula. The proposed project would also be consistent with goals related to ensuring an adequate water supply system.

4.3.1.4 San Francisco Municipal Green Building Program

The San Francisco Municipal Green Building Program was developed for the purpose of improving the environmental performance of municipal buildings. Since the LCSDI project does not include any structures that would total more than 5,000 square feet, the project would not be required to meet the LEED Silver Certification requirement. The SFPUC would coordinate with the REB Task Force to implement recommended best practices and sample specifications for construction materials (e.g., recycled steel and concrete), as appropriate, and the proposed project would be designed, constructed, and operated in accordance with San Francisco's Green Building requirements.

4.3.2 Consistency with SFPUC Plans and Policies

4.3.2.1 Peninsula Watershed Management Plan

The Peninsula WMP was designed to improve the SFPUC's ability to protect the overall watershed as well as the specific resources that make up the watershed. The LCSDI project would directly address both the primary goal of the Peninsula WMP (to maintain and improve water quality to protect public health and safety) and the secondary goal (to maximize local water supply). The SFPUC Natural Resources Division would review the proposed LCSDI project for conformity with the WMP as well as for compliance with environmental codes and regulations. As part of project implementation, the SFPUC would coordinate internally with its Natural Resources Division to carry out the project in conformance with the appropriate goals, policies, and implementation actions of the Peninsula WMP, including those pertaining to water supply protection, and the secondary goals of maximizing local water supply, natural resource protection, watershed protection, and land use compatibility.

During construction and operation, the proposed project has the potential for adverse impacts related to land use, visual resources, cultural resources, transportation, noise, air quality, recreation, utilities, sensitive species and habitats, fisheries, geology, water quality, hazards, and energy resources. However, the project would avoid or minimize construction and operational impacts through implementation of SFPUC Greenhouse Gas Reduction Actions (Section 5.8), project-proposed best management practices to avoid or minimize water quality impacts (Section 5.15), and mitigation measures identified in Chapter 5 for land use, visual resources, cultural resources, transportation, noise, air quality, recreation, utilities, sensitive species and habitats, fisheries, geology, water quality, and hazards. Implementation of mitigation measures identified in this EIR and compliance with the permitting requirements of the project would be integrated with implementation of the ongoing environmental protection and enhancement efforts of the SFPUC, such as actions under the Water Enterprise Environmental Stewardship Policy. By restoring the historical capacity of the reservoir, the proposed project would protect and maximize the source of local water supply in the SFPUC regional system. Consequently, the project would, taken as a whole, be consistent with the Peninsula WMP.

4.3.2.2 Water Enterprise Environmental Stewardship Policy

The proposed project could affect the integrity of natural resources, habitats for native species, and ecosystem functions in the Peninsula watershed. However, the Stewardship Policy implementation strategy specifically requires the integration of the policy into individual infrastructure projects such as the LCSDI project. As discussed in Sections 5.13, Biological Resources, and 5.15, Hydrology and Water Quality, significant impacts on natural resources, habitats, or ecosystems could be mitigated to a less-than-significant level through implementation of the mitigation measures identified in those sections. Although the Stewardship Policy includes provisions for operating the water system in a manner that protects and restores native fish and wildlife downstream of SFPUC dams and for releases from SFPUC reservoirs to mimic the variation of the seasonal hydrology, the proposed project would not result in any changes to the existing operational and management goals for Crystal Springs Reservoir or Lower Crystal Spring Dam. With implementation of the mitigation measures identified in this EIR, the project, on the whole, would be consistent with the underlying goals of the Water Enterprise Environmental Stewardship Policy.

4.3.2.3 Right of Way Integrated Vegetation Management Policy

Under the proposed project, the SFPUC would remove vegetation, including trees, along a 200-foot-long corridor near the toe of the dam to allow for the installation of a temporary access road to the stilling basin as well as the construction of the proposed expanded stilling basin. Project construction would also require the removal of trees and other vegetation at Staging and Storage Area 1. As part of project implementation, the SFPUC would coordinate internally with its Natural Resources Division to assure project conformance with the appropriate goals and polices of the Vegetation Management Policy. In addition, implementation of the mitigation measures identified in Sections 5.13, Biological Resources, and 5.15, Hydrology and Water Quality, would reduce significant impacts on natural resources, habitats, and ecosystems to a less-than-significant level. The project would be consistent with the Vegetation Management Policy.

4.3.3 Consistency with Applicable Federal and State Plans and Policies

4.3.3.1 Golden Gate International Biosphere Reserve Designation

The SFPUC retains the right to carry out the necessary actions on Peninsula watershed lands related to operation and maintenance of the regional water system. The SFPUC is committed to maintaining and protecting Peninsula watershed lands in their present state as open space land and for public use and enjoyment, provided that these uses do not conflict with operation and maintenance of the regional water system. As such, construction and operation of the proposed project on SFPUC Peninsula watershed lands would be consistent with the Golden Gate International Biosphere Reserve designation.

4.3.3.2 U.S. Department of the Interior, GGNRA Scenic Easement and Scenic and Recreation Easement

The GGNRA Scenic Easement and Scenic and Recreation Easement place restrictive covenants on the use of lands that are unrelated to the SFPUC's overall management of the watershed for utility purposes. SFPUC construction activities related to utility management are not subject to the provisions of these easements. Because construction-related activities at existing SFPUC water facilities would constitute a temporary use for water utility purposes and long-term operations would generally be the same as existing operations, the project would be consistent with the provisions of both GGNRA easements. Temporary conflicts during construction related to access to recreational areas, such as the Lower Crystal Springs Dam viewing area, would occur for water utility purposes, which would be consistent with the provisions of both easements.

4.3.3.3 California Department of Fish and Game, Game Refuge Designation

Section 10654 of the Fish and Game Code states that the SFPUC is authorized to carry out reasonable measures to protect the SFPUC water supply. As such, construction and operation of the proposed project on SFPUC Peninsula watershed lands would be consistent with the requirements of the game refuge designation.

4.3.4 Consistency with Local Land Use Plans and Policies

As described above, the SFPUC is not legally bound by the zoning and building laws of other local governments. Determinations of project consistency with local general plans would be made by the pertinent land use jurisdictions following preparation of this EIR and through notification by the SFPUC pursuant to state law.

Under the proposed project, improvements would be made to existing SFPUC facilities, and no new facilities would be constructed. Only one component—the enlargement of the stilling basin—involves expansion of the existing footprint of SFPUC facilities. The new stilling basin would replace about one-half acre of open space with facilities, but this incremental change would occur in an area surrounded by other SFPUC facilities. The project area is generally located in permanent open space areas adjacent to established low-density residential and semi-rural communities in unincorporated San Mateo County. The San Mateo County General Plan seeks to preserve the open space and rural community character, protect natural resources and unique physical features, protect the health and safety of residents, and support unique recreation and visual features of the area.

The intent of the San Mateo County General Plan is to preserve and improve the quality of life for citizens and to consider growth and infrastructure improvements in a manner that appropriately reflects the county's values. Unincorporated areas and cities within the county receive all or part of their water supply from the SFPUC. An adequate, sanitary, and reliable water supply is a fundamental public service requirement to accomplish these goals.

As previously described, the San Mateo County General Plan contains policies applicable to the LCSDI project that address environmental resources, including locating utilities to avoid or minimize damage from hazards; protecting sensitive wildlife habitats and plants; implementing erosion control measures and stormwater quality controls; locating utility lines underground to minimize visual impacts; conserving and protecting archaeological and historic resources; implementing practices to protect human health, such as dust abatement measures during construction and limiting the hours of construction to minimize noise impacts on surrounding uses; and maintaining adequate roadway capacity for traffic, emergency services, bicycles and pedestrians. In addition, the San Mateo County General Plan includes policies specifically related to the protection of SFPUC water supply and watershed lands and that call for coordination with the SFPUC to ensure a reliable source of water. All of these policies are addressed where relevant in Sections 5.2 through 5.18 of this EIR.

As noted above, the proposed project would result in a significant and unavoidable adverse impact on Lower Crystal Springs Dam as a historic resource and a significant and unavoidable, adverse, cumulative impact on historic resources due to effects on Lower Crystal Springs Dam in conjunction with effects on Crystal Springs Outlet Structure 1 that would occur under the SFPUC's Crystal Springs/San Andreas Transmission Upgrade project. Proposed project operations could result in a potentially significant and unavoidable impact on visual resources. . The proposed project also would have significant and unavoidable impacts—both project-specific and cumulative—resulting from construction-related exhaust emissions and construction-related noise effects. The project's contribution to cumulative recreational impacts would be significant, resulting in a significant and unavoidable, cumulative impact when considered in combination with other reasonably foreseeable projects in the vicinity.

On the whole, however, the LCSDI project would support the objectives and policies of the San Mateo County General Plan through the implementation of mitigation measures included in Sections 5.3, Aesthetics; 5.5, Cultural and Paleontological Resources; 5.6, Transportation and Circulation; 5.7, Noise and Vibration; 5.8, Air Quality; 5.10, Recreation; 5.13, Biological Resources; 5.15, Hydrology and Water Quality; and 5.16, Hazards and Hazardous Materials. In general, implementation of these measures would avoid or reduce potential adverse impacts to less-than-significant levels. However, in some cases, implementation of identified mitigation measures would only reduce potential adverse impacts to the extent feasible, including the significant and unavoidable adverse impacts on historic resources, noise, air quality,[4] and recreation and the potentially significant and unavoidable adverse impact on visual impacts. Nevertheless, the proposed project would conform to the broader goals of the general plan to maintain and improve the quality of life of the local population by increasing the reliability of the water supply, meeting water supply needs, and maintaining high-quality water. For the foregoing reasons, the LCSDI project is on balance consistent with the San Mateo County General Plan.

The LCSDI project would not conflict with the Trail Policies, Design Guidelines, or Use and Management Guidelines of the San Mateo County Trails Plan because project implementation would have no long-term effect on recreational activities along existing County trails, nor prevent the construction of new trails.

Similarly, the LCSDI project would also not conflict with the San Mateo County Comprehensive Bicycle Route Plan because project implementation would have no long-term effect on existing existing bicycle routes, nor prevent the designation or construction of new bicycle routes.

4.4 References

City and County of San Francisco (CCSF), *General Plan*, 1988, as amended through 1996.

City and County of San Francisco (CCSF), Department of the Environment, *The Sustainability Plan for the City of San Francisco*, 1997.

City and County of San Francisco (CCSF), San Francisco Department of the Environment, San Francisco Municipal Green Building Report 2004–2007.

San Francisco Public Utilities Commission (SFPUC), SFPUC Final Water Enterprise Environmental Stewardship Policy, June 27, 2006.

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[4] Both project-level and cumulative impacts related to construction air emissions would be potentially significant but mitigable under the adopted 1999 Bay Area Air Quality Management District (BAAQMD) guidelines for assessing and mitigating air quality impacts. However, based on the proposed 2009 BAAQMD CEQA Air Quality Guidelines, these impacts would be considered significant and unavoidable.

San Francisco Public Utilities Commission (SFPUC), Right of Way Integrated Vegetation Management Policy, February 2007.

San Francisco Public Utilities Commission (SFPUC), *Peninsula Watershed Management Plan*, 2002 (adopted 2001).

San Mateo County, Department of Environmental Management, Planning and Development Division, *San Mateo County General Plan*, 1986.

CHAPTER 5

Environmental Setting, Impacts, and Mitigation Measures

5.1 Overview

This chapter provides a project-level impact analysis of the physical environmental effects of implementing the Lower Crystal Springs Dam Improvements (LCSDI) project as described in Chapter 3, Project Description. This chapter describes the environmental setting, assesses impacts, and identifies mitigation measures for potentially significant and significant impacts.

5.1.1 Scope of Analysis

This chapter is organized by environmental resource topic, as follows:

Chapter 5 Sections			
5.1	Overview	5.10	Recreation
5.2	Land Use	5.11	Utilities and Service Systems
5.3	Aesthetics	5.12	Public Services
5.4	Population and Housing	5.13	Biological Resources
5.5	Cultural and Paleontological Resources	5.14	Geology and Soils
5.6	Transportation and Circulation	5.15	Hydrology and Water Quality
5.7	Noise and Vibration	5.16	Hazards and Hazardous Materials
5.8	Air Quality	5.17	Mineral and Energy Resources
5.9	Wind and Shadow	5.18	Agricultural Resources
			(References included under each section)

Each section of Chapter 5 contains the following elements, based on the requirements of the California Environmental Quality Act (CEQA):

- **Setting.** This subsection presents a description of the existing physical environmental conditions in the project area with respect to each resource topic at an appropriate level of detail to allow the reader to understand the impact analysis.

- **Regulatory Framework.** This subsection describes the relevant laws and regulations that apply to protecting the environmental resources within the project area and the governmental agencies responsible for enforcing those laws and regulations.

- **Impacts.** This subsection evaluates the potential for the proposed project to result in adverse effects on the physical environment described in the setting. Significance criteria for evaluating the environmental impacts are defined at the beginning of each impact analysis section, and the Approach to Analysis explains how the significance criteria are applied in evaluating the impacts of the project. The conclusion of each impact analysis is expressed in terms of the impact significance, which is discussed further in Section 5.1.2 below.

- **Mitigation Measures.** In each subsection, mitigation measures are identified for all of the impacts considered significant or potentially significant, consistent with the CEQA Guidelines Section 15126.4, which states that an environmental impact report (EIR), "shall describe feasible measures which could minimize significant adverse impacts…" The SFPUC, as the project sponsor, has indicated that, if the project is approved, it would incorporate all mitigation measures identified in this EIR as part of the project.

- **Cumulative Impacts.** In each subsection where applicable, cumulative impacts are discussed immediately following the description of the direct project-specific impacts and identified mitigation measures. Cumulative impacts, described in detail in Section 5.1.4, consider the effects of the proposed project together with those of other past, present, or reasonably foreseeable future projects proposed by the SFPUC or other jurisdictions. The analysis of cumulative impacts under each resource topic is based on the same setting, regulatory framework, and significance criteria as the direct impacts. Additional mitigation measures are identified if the analysis determines that the project's contribution to a cumulative, adverse impact would be significant.

5.1.2 Significance Determinations

The significance criteria used in this EIR are based on the San Francisco Planning Department's Major Environmental Analysis Division (MEA) guidance regarding the thresholds of significance used to assess the severity of environmental impacts of the project. MEA guidance is based on CEQA Guidelines Appendix G, with some modifications. The significance criteria used to analyze each environmental resource topic are presented in each section of Chapter 5 before the discussion of impacts. The categories used to designate impact significance are described below:

- **Beneficial (B).** This determination applies if implementation of the proposed project would result in an improvement or enhancement of an environmental resource compared to existing condition. No mitigation is required for impacts determined to be beneficial.

- **Not Applicable (N/A).** An impact is considered not applicable (no impact) if there is no potential for impacts or the environmental resource does not occur within the project area or the area of potential effect. For example, there would be no impacts related to grading if there is no grading proposed at a particular project site.

- **Less than Significant impact (LS).** This determination applies if there is a potential for some limited impact, but not a substantial, adverse effect that qualifies under the significance criteria as a significant impact. No mitigation is required for impacts determined to be LS.

- **Significant impact that can be Mitigated to less than significant (SM).** This determination applies if there is certainty that the project would result in an adverse effect that meets the significance criteria, but feasible mitigation is available that would reduce the impact to a less-than-significant level.

- **Potentially Significant impact that can be Mitigated to less than significant (PSM).** This determination applies if there is a potential for the project to result in an adverse effect that meets the significance criteria, but feasible mitigation is available that would reduce the impact to a less-than-significant level. An impact identified as "potentially" significant indicates there is a potential for this impact to occur, but there is either not enough project information or site-specific information to determine definitively whether or not it qualifies under the significance criteria as significant. In these cases, the EIR makes the more conservative determination. The impacts identified as "potentially significant" are treated as significant impacts in this EIR.

- **Significant Unavoidable impact (SU).** This determination applies if there is a certainty that the project would result in an adverse effect that meets the significance criteria, but there appears to be no feasible mitigation available to reduce the impact to a less-than-significant level. There might be some mitigation available to lessen the impact, but the residual effect after implementation of the measure would remain significant, and therefore the impact is unavoidable.

- **Potentially Significant Unavoidable impact (PSU).** This determination applies if there is a potential for the project to result in an adverse effect that meets the significance criteria, but for which there appears to be no feasible mitigation available to reduce the impact to a less-than-significant level. There might be some mitigation available to lessen the impact, but the residual effect after implementation of the measure would remain significant under the significance criteria, and therefore the impact is unavoidable. An impact identified as "potentially" significant indicates there is a potential for this impact to occur, but there is either not enough project information or site-specific information to determine definitively whether or not it qualifies under the significance criteria as significant. In these cases, the EIR makes the more conservative determination. The impacts identified as "potentially significant" are treated as significant impacts in this EIR.

5.1.3 Relationship to the WSIP

As described in Chapter 2, Introduction and Background, the proposed project is one of the key regional facility improvement projects in the SFPUC's Water System Improvement Program (WSIP). The Program EIR (PEIR) on the WSIP,[1] which the San Francisco Planning Commission certified on October 30, 2008, addresses the potential environmental impacts of constructing and operating the key regional facility improvement projects in the WSIP as well as the impacts of the proposed systemwide water supply and operations strategy (San Francisco Planning Department, 2008b). Because the proposed project is a component of the WSIP, the project would also contribute to the WSIP's systemwide water supply and operations impacts.

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[1] The WSIP PEIR is available for public review at the San Francisco Planning Department, 1650 Mission Street, San Francisco, CA 94103, and can be found on the San Francisco Planning Department's website at http://www.sfgov.org/planning/mea. The State Clearinghouse number for the WSIP PEIR is 2005092026.

The PEIR analyzed potential water supply and system operations impacts (separate from the environmental impacts associated with the facility improvements) within the following geographic regions: the Tuolumne River, Alameda Creek, and Peninsula watersheds and the Westside Groundwater Basin. The PEIR also identified the cumulative effects of implementing the WSIP and the associated changes in system operations in combination with other past, present, and reasonably foreseeable future projects within each of these watersheds. It also discussed the potential effects of climate change and global warming on the predicted impacts of the WSIP.

The PEIR concluded that the WSIP would result in changes in reservoir levels and associated changes in downstream flows in rivers and creeks in the three affected watersheds (Tuolumne River, Alameda Creek, and Peninsula), potentially resulting in impacts on groundwater, water quality, fisheries, and terrestrial biological resources in these watersheds. The PEIR determined that in the event that water supply deliveries to customers (average annual) from the watersheds exceed current levels, streamflow changes in the Tuolumne River watershed could affect fisheries and terrestrial biological resources. In the Alameda watershed, the WSIP (which includes restoring the historical storage capacity of Calaveras Reservoir) could affect water levels in Calaveras and San Antonio Reservoirs, flow in Alameda, Calaveras, and San Antonio Creeks, and the fisheries and terrestrial biological resources of the reservoirs and creeks. In the Peninsula watershed, the WSIP (which includes restoring the historical storage capacity of Crystal Springs Reservoir) could affect water levels in Crystal Springs, San Andreas, and Pilarcitos Reservoirs, flow in lower San Mateo and Pilarcitos Creeks, and the fisheries and terrestrial biological resources of these reservoirs and creeks. All impacts on these environmental elements in the Peninsula watershed were determined to be either potentially significant but mitigable or less-than- significant. In addition, the WSIP includes development of groundwater supplies in the North Westside Groundwater Basin and a conjunctive-use program in the South Westside Groundwater Basin which could result in basin overdraft, seawater intrusion, and changes in the water levels of surface water bodies.

As stated above, the LCSDI project as a component of the WSIP would contribute to the water supply and system operations impacts identified in the WSIP PEIR. Tables D-1 through D-4 in **Appendix D** of this EIR summarize the WSIP water supply and system operations impacts and the associated mitigation measures for each geographic region as presented in the PEIR. The reader is referred to the complete WSIP PEIR for a detailed explanation of these summary tables.

In addition to water supply impacts and mitigation measures, the PEIR provides a program-level analysis of the impacts associated with key regional WSIP facility improvement projects, including construction and operation impacts. This EIR addresses the same issues as the PEIR for the proposed project, but at a project level of detail; it provides more project-specific and site-specific descriptions and analysis of project effects based on a much more detailed project description and more information about the project area. **Appendix E** of this EIR presents a comparison between the programmatic mitigation measures identified for this project in the PEIR and the actual mitigation measures identified for this project in this EIR.

The PEIR also analyzed the growth inducement impacts of the WSIP's systemwide water supply impacts. The proposed project, as a facility improvement project under the WSIP, would be a contributing factor in the growth inducing potential of the WSIP and the associated indirect effects of growth. The growth-inducing impacts of the WSIP are summarized in Section 5.4, Population and Housing, and discussed in Chapter 7 of this EIR.

This project-level EIR tiers from the WSIP PEIR and also incorporates by reference the relevant analyses of the WSIP PEIR with respect to the impacts and mitigation measures, as applicable to this project. CEQA permits tiering from a program EIR in order to allow agencies to broadly consider the environmental effects of a series of actions and/or policies and then to provide a more detailed examination of project-specific impacts in project-level EIRs. The LCSDI project was identified and analyzed as part of the WSIP in the PEIR. This project-level EIR provides more detailed information about the proposed project, its impacts, and project-specific mitigation measures. This EIR summarizes and incorporates by reference the WSIP PEIR's analysis of the impacts associated with the WSIP's water supply strategy, including the WSIP PEIR analysis and conclusions regarding impacts on the CCSF's watersheds and growth-inducement impacts.

5.1.4 Cumulative Impacts

Cumulative impacts, as defined in Section 15355 of the CEQA Guidelines, refer to two or more individual effects that, when taken together, are "considerable" or that compound or increase other environmental impacts. A cumulative impact from several projects is the change in the environment that would result from the incremental impact of the project when added to those of other closely related past, present, or reasonably foreseeable future projects. Pertinent guidance for cumulative impact analysis is provided in Section 15130 of the CEQA Guidelines:

- An EIR shall discuss cumulative impacts of a project when the project's incremental effect is "cumulatively considerable" (e.g., the incremental effects of an individual project are considerable when viewed in connection with the effects of past, current, and probable future projects, including those outside the control of the agency, if necessary).
- An EIR should not discuss impacts that do not result in part from the project evaluated in the EIR.
- A project's contribution is less than cumulatively considerable, and thus not significant, if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact.
- The discussion of impact severity and likelihood of occurrence need not be as detailed as for effects attributable to the project alone.
- The focus of analysis should be on the cumulative impact to which the identified other projects contribute, rather than on attributes of the other projects that do not contribute to the cumulative impact.

The cumulative impact analysis for each individual resource topic is described in each subsection of this chapter, immediately following the description of the direct project impacts and identified mitigation measures. A summary of all cumulative impacts is provided in Chapter 7, Section 7.2.

5.1.4.1 Approach to Cumulative Impact Analysis

Two approaches to a cumulative impact analysis are provided in CEQA Guidelines Section 15130(b)(1): (a) the analysis can be based on a list of past, present, and probable future projects producing related or cumulative impacts, or (b) a summary of projections contained in a general plan or related planning document can be used to determine cumulative impacts. For the purpose of this EIR, the analysis employs the list-based approach. The following factors were used to determine an appropriate list of projects to be considered in this cumulative analysis:

- **Similar Environmental Impacts** – A relevant project contributes to effects on resources that are also affected by the proposed project. A relevant future project is defined as one that is "reasonably foreseeable," such as a proposed project for which an application has been filed with the approving agency or has approved funding.
- **Geographic Scope and Location** – A relevant project is located within the defined geographic scope for the cumulative effect.
- **Timing and Duration of Implementation** – Effects associated with activities for a relevant project (e.g., short-term construction or demolition, or long-term operations) would likely coincide in timing with the effects of the proposed project.

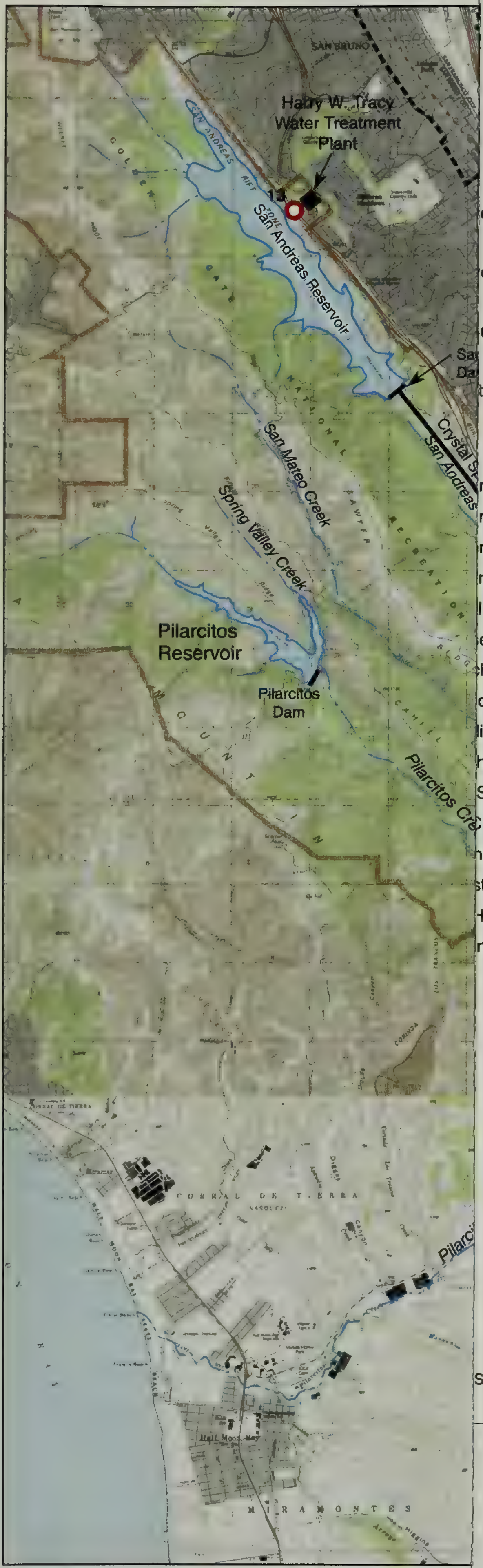
Other Projects with Similar Environmental Impacts

Projects that are relevant to the cumulative analysis include those that could contribute incremental effects on the same environmental resources and would have similar environmental impacts as those discussed in this EIR. The cumulative impacts portions of Sections 5.2 through 5.18 in this chapter analyze the potential cumulative impacts that could occur when the impacts of the proposed project are considered in combination with the impacts of other past, present, and reasonably foreseeable future projects. It should be noted that the reasonably foreseeable future projects are subject to independent environmental review and consideration by approving agencies. Consequently, it is possible that some of the projects will not be approved or will be modified prior to approval (e.g., as a result of the CEQA alternatives process). For the purposes of assessing worst-case cumulative impacts, however, the cumulative impact analysis is premised on the approval and construction of all of the following potential projects.

The relevant projects used in the cumulative impact analysis are listed in **Table 5.1-1** and their locations shown in **Figure 5.1-1**. Section 5.1.4.2, Section 5.1.4.3, and Section 5.1.4.4 provide a brief description of the key projects in the vicinity of Lower Crystal Springs Dam, Sampling Station #5, and Crystal Springs Reservoir, respectively.

Geographic Scope and Location

The geographic scope of cumulative projects is dependent on the resource topic affected and is identified at the beginning of each cumulative impact discussion. In general, the geographic scope includes the areas adjacent to the proposed construction activities at Lower Crystal Springs Dam (LCSD) and Sampling Station #5. For some resource topics, the geographic scope can extend farther; for example, to Crystal Springs Reservoir and the greater Peninsula watershed, regional roadway network, or regional air basin.



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e Project Location

umulative Project Locations

tal Springs Bypass Tunnel

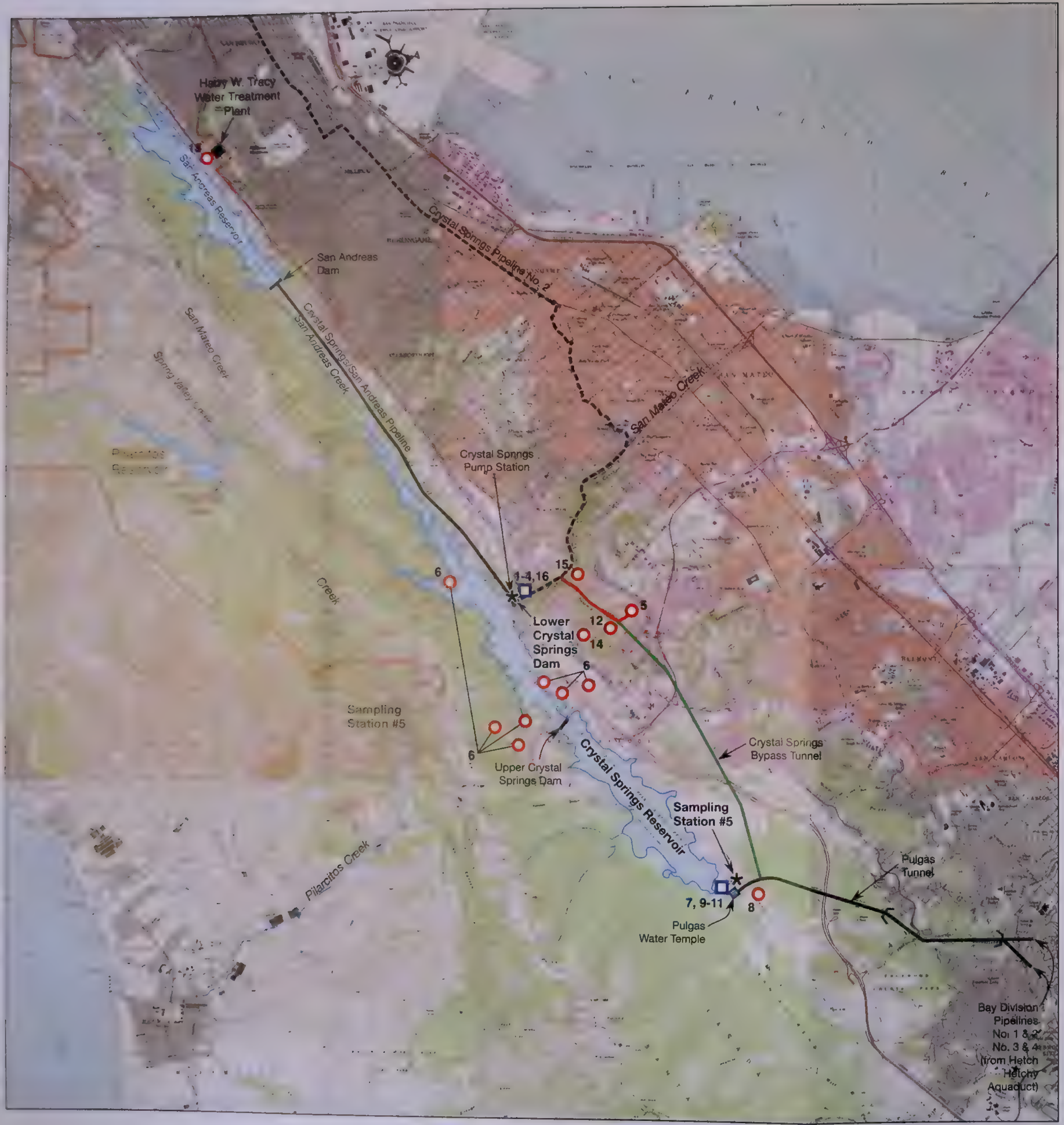
ngs Dam Bridge Replacement
ngs / San Andreas Transmission Upgrade
rson-Martin Transmission Line
ngs Pipeline No. 2 Replacement
l Springs Bypass Tunnel
erve Program
harge Channel Modifications
ctural Rehabilitation and Roof Replacement
lification of Existing Dechloramination Facility
hloramination Sampling Station #5
San Pedro Valve Lots Improvement
reek Restoration
ng Term Improvements
states Residential Development
Heights Residential Development
ngs Regional Trail Extension

0 2
Miles

SA + Orion; USGS 1978

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.1-1
Cumulative Project Locations



Harry W. Tracy Water Treatment Plant
13
San Andreas Reservoir
San Andreas Dam
Crystal Springs Pipeline No. 2
San Mateo Creek
Crystal Springs/San Andreas Pipeline
San Andreas Creek
San Mateo Creek
Spring Valley Lakes
Pilarcitos Reservoir
Crystal Springs Pump Station
Creek
6
1-4,16
15
5
Lower Crystal Springs Dam
12
14
6
Sampling Station #5
6
Upper Crystal Springs Dam
Crystal Springs Bypass Tunnel
Crystal Springs Reservoir
Sampling Station #5
Pulgas Tunnel
7, 9-11
8
Pulgas Water Temple
Pilarcitos Creek
Bay Division Pipelines No. 1 & 2, No. 3 & 4 (from Hetch Hetchy Aqueduct)
0
2
Miles

★ LCSDI Site

○ Cumulative Project Location

□ Multiple Cumulative Project Locations

— New Crystal Springs Bypass Tunnel

1. Crystal Springs Dam Bridge Replacement
2. Crystal Springs / San Andreas Transmission Upgrade
3. PG&E Jefferson-Martin Transmission Line
4. Crystal Springs Pipeline No. 2 Replacement
5. New Crystal Springs Bypass Tunnel
6. Habitat Reserve Program
7. Pulgas Discharge Channel Modifications
8. Pulgas Structural Rehabilitation and Roof Replacement
9. Pulgas Modification of Existing Dechloramination Facility
10. Pulgas Dechloramination Sampling Station #5
11. Baden and San Pedro Valve Lots Improvement
12. Polhemus Creek Restoration
13. HTWTP Long Term Improvements
14. Highland Estates Residential Development
15. Ascension Heights Residential Development
16. Crystal Springs Regional Trail Extension

SOURCE: ESA + Orion; USGS 1978

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.1-1
Cumulative Project Locations

Timing and Duration of Implementation

The proposed project is estimated to be constructed over a 14-month period. Based on currently available project planning information, the construction of the proposed project would overlap with work on other projects in the immediate vicinity, including the Crystal Springs Dam Bridge Replacement project, the Crystal Springs/San Andreas (CSSA) Transmission Upgrade project, the Crystal Springs Pipeline No. 2 (CSPL2) Replacement project, the Pacific Gas & Electric Company (PG&E) Jefferson-Martin Transmission Line project, and the New Crystal Springs Bypass Tunnel (NCSBT) project. In addition, construction activities at the Pulgas Discharge Channel's Sampling Station #5 would overlap with cumulative projects located at the Pulgas Discharge Channel and in the vicinity of the Pulgas Water Temple. Overlap would occur with the various project components and potentially with roadway closures and construction staging areas. **Figure 5.1-2** shows the construction schedules for the above-mentioned projects. Components of these cumulative projects that overlap with components of the LCSDI project are discussed below.

5.1.4.2 Cumulative Projects in the Lower Crystal Springs Dam Vicinity

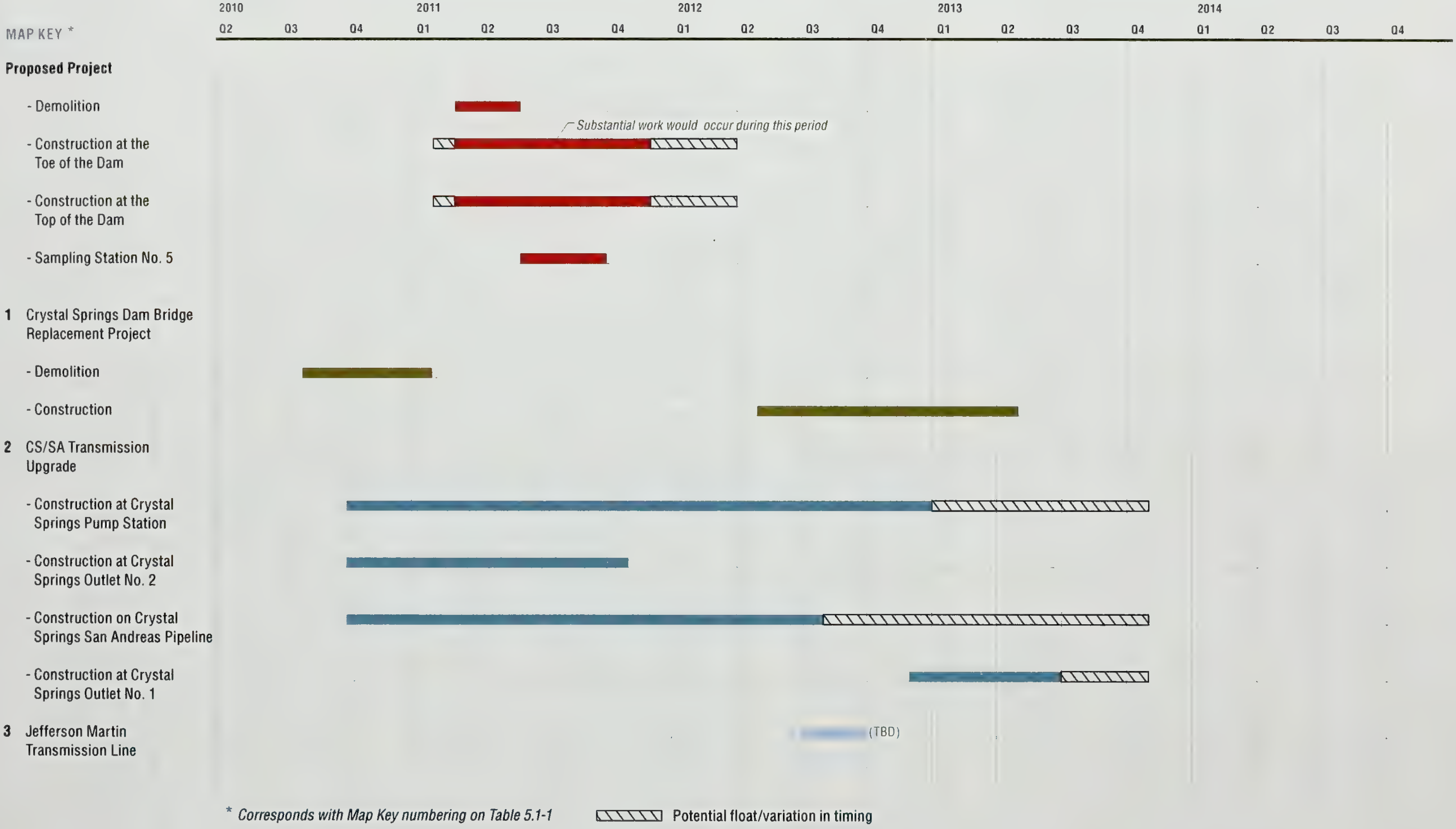
This section presents a brief description of the key projects that would be expected to contribute to cumulative impacts in combination with the identified impacts of the LCSDI project. The cumulative impact analysis is presented under each resource topic, and a summary of all cumulative impacts is provided in Chapter 7, Section 7.2.

San Mateo County Crystal Springs Dam Bridge Replacement Project

This project would involve San Mateo County's replacement of the county bridge that spans the top of the LCSD. San Mateo County has determined that the Skyline Boulevard Bridge requires extensive seismic upgrades and currently imposes lane and weight limitations on bridge traffic. The SFPUC would coordinate the timing of LCSDI project construction with San Mateo County to ensure that the proposed project would commence only after the county demolishes the bridge. Coordination of the two projects would be required for design considerations for both projects and could also result in construction efficiencies. It is anticipated that San Mateo County would first demolish and remove the existing Skyline Boulevard Bridge over a 6-month period. Once the bridge has been removed, San Mateo County would demobilize its construction site, and the SFPUC would initiate construction activities for the proposed project. Upon completion of the proposed project, San Mateo County would construct the replacement bridge, which would take approximately 12 months. While no construction activities between these two projects would overlap, occupation of the staging areas could overlap, and the two projects would cumulatively result in construction disruption at the same location for a minimum of 32 months. The combination of construction activities for the LCSDI project and the Crystal Springs Dam Bridge Replacement project would require that a segment of Skyline Boulevard in the vicinity of the bridge be temporarily closed to vehicles, bicyclists, and pedestrians for approximately 32 months.

Crystal Springs/San Andreas Transmission Upgrade Project

Construction of the CSSA Transmission Upgrade project would occur concurrently with construction of the LCSDI project. The CSSA Transmission Upgrade project includes components

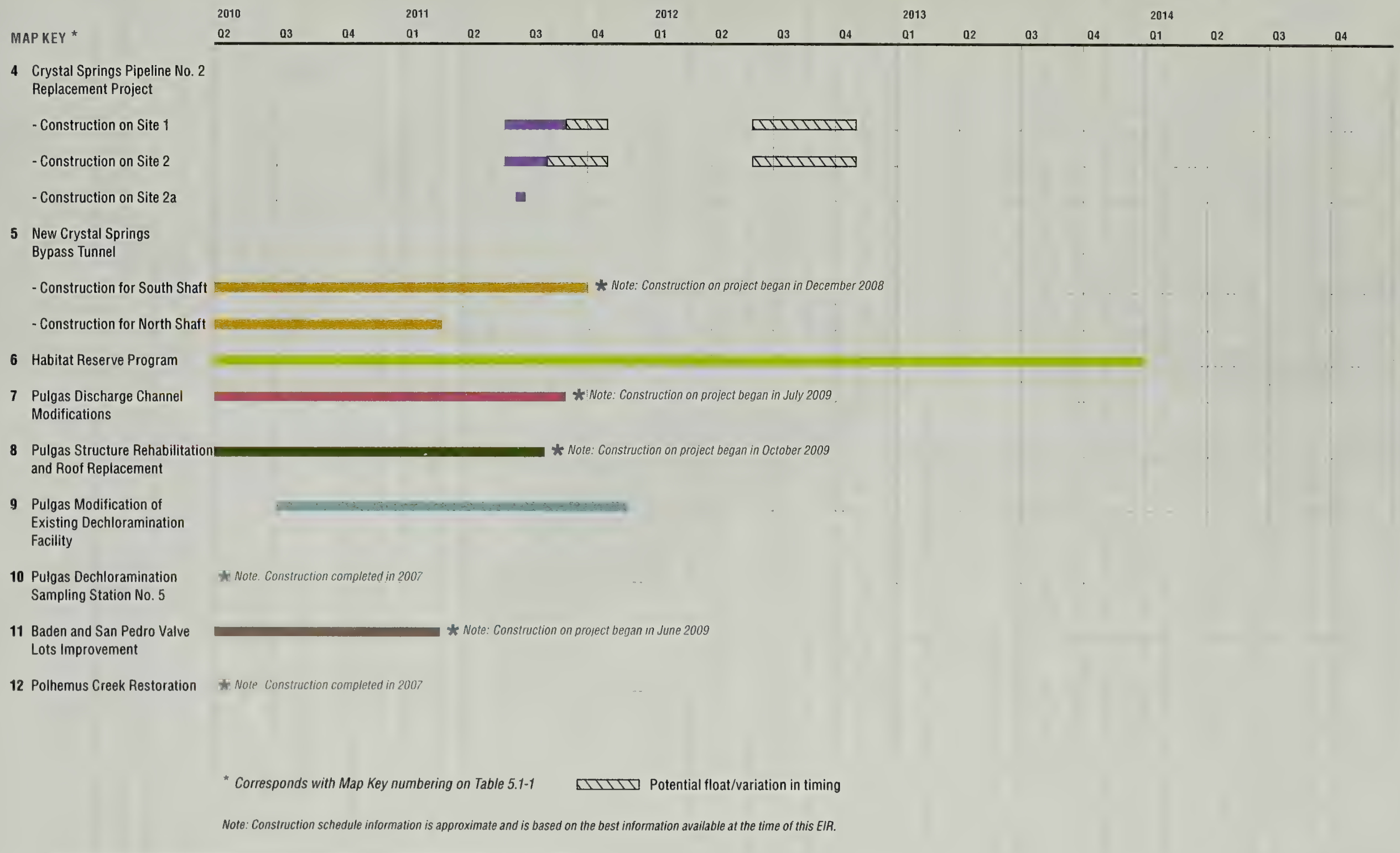


* *Corresponds with Map Key numbering on Table 5.1-1*

Note: Construction schedule information is approximate and is based on the best information available at the time of this EIR.

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.1-2
Cumulative Projects with Overlapping Construction Schedules (1 of 2)



Note: Construction schedule information is approximate and is based on the best information available at the time of this EIR.

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.1-2

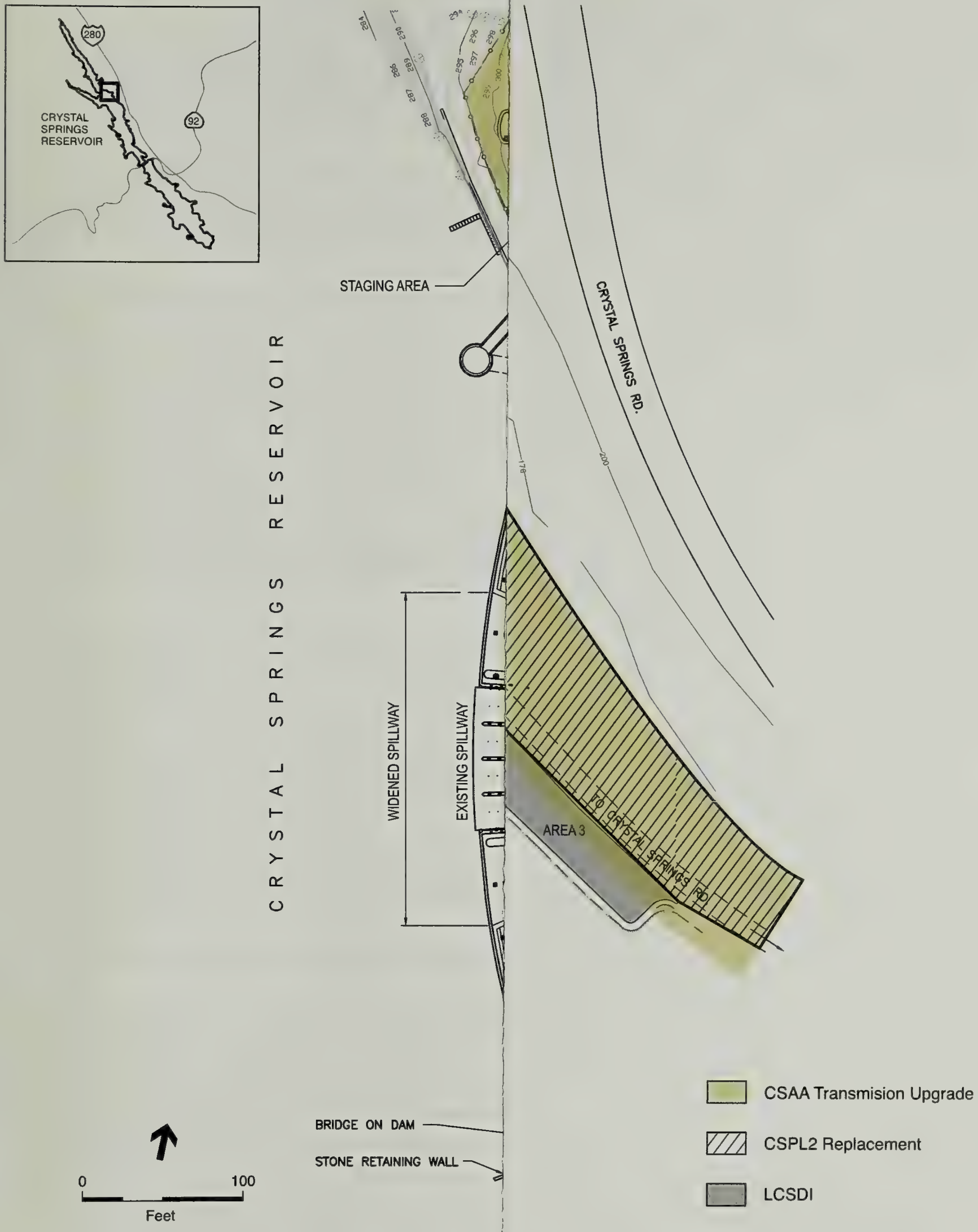
Cumulative Projects with Overlapping Construction Schedules (2 of 2) that would be constructed at or near the LCSD. Outlet structures would be constructed along the northeastern banks of Crystal Springs Reservoir, adjacent to the LCSD. This project includes improvements to the Crystal Springs Pump Station, which sits immediately adjacent to the toe of the dam, as well as installation of the new pipeline in the vicinity of the dam (see Figure 3-10 in Chapter 3, Project Description) and outfall structures along San Mateo Creek. Construction of these project components could result in cumulative effects on biological resources, water quality, aesthetics, and cultural resources as well as cumulative construction effects on traffic, noise, and air quality. As with the CSSA Transmission Upgrade project, the contractor for the LCSDI project might elect to perform certain construction activities from a barge in the reservoir. In addition, the CSSA Transmission Upgrade project and the proposed project would make use of the same or adjacent staging areas, including the Crystal Springs Pump Station (see **Figure 5.1-3**); they would also have overlapping haul routes for construction traffic and thus would contribute to increases in air quality and noise effects.

Crystal Springs Pipeline No. 2 Replacement Project

The CSPL2 Replacement project would involve pipeline replacement at two sites in the immediate vicinity of the LCSD site: CSPL2 Sites 1 and 2 (see Figure 3-10 in Chapter 3, Project Description). The major construction activities for the CSPL2 Replacement project at these two sites would require single lane closures and are scheduled to occur in either mid-2011 or mid-2012, potentially overlapping with LCSDI construction activities in 2011. Pipeline replacement at Sites 1 and 2 would require closure of one of the two travel lanes along Crystal Springs Road for 30 days, resulting in alternate one-way traffic operations along Crystal Springs Road at the same time the LCSDI project is being constructed if these pipeline replacement activities occur in 2011. The CSPL2 Replacement project would use the Crystal Springs Pump Station as a staging area, but this staging area would only be used when pipeline replacement work at Sites 1 and 2 is taking place. Therefore, the potential exists for the CSPL2 Replacement project to overlap in staging area use in the pump station vicinity in 2011, and construction activities at this location would be extended by the construction activities associated with the CSSA Transmission Upgrade project described above.

In addition, the CSPL2 Replacement project includes installation of tee and isolation valves at CSPL2 Site 2 in 2011, which would overlap with the construction activities of both the LCSDI project and the CSSA Transmission Upgrade project. This valve installation would require closure of Crystal Springs Road for five days and would result in cumulative construction impacts for these five days when considered in combination with the LCSDI project (and CSSA Transmission Upgrade project) construction activities.

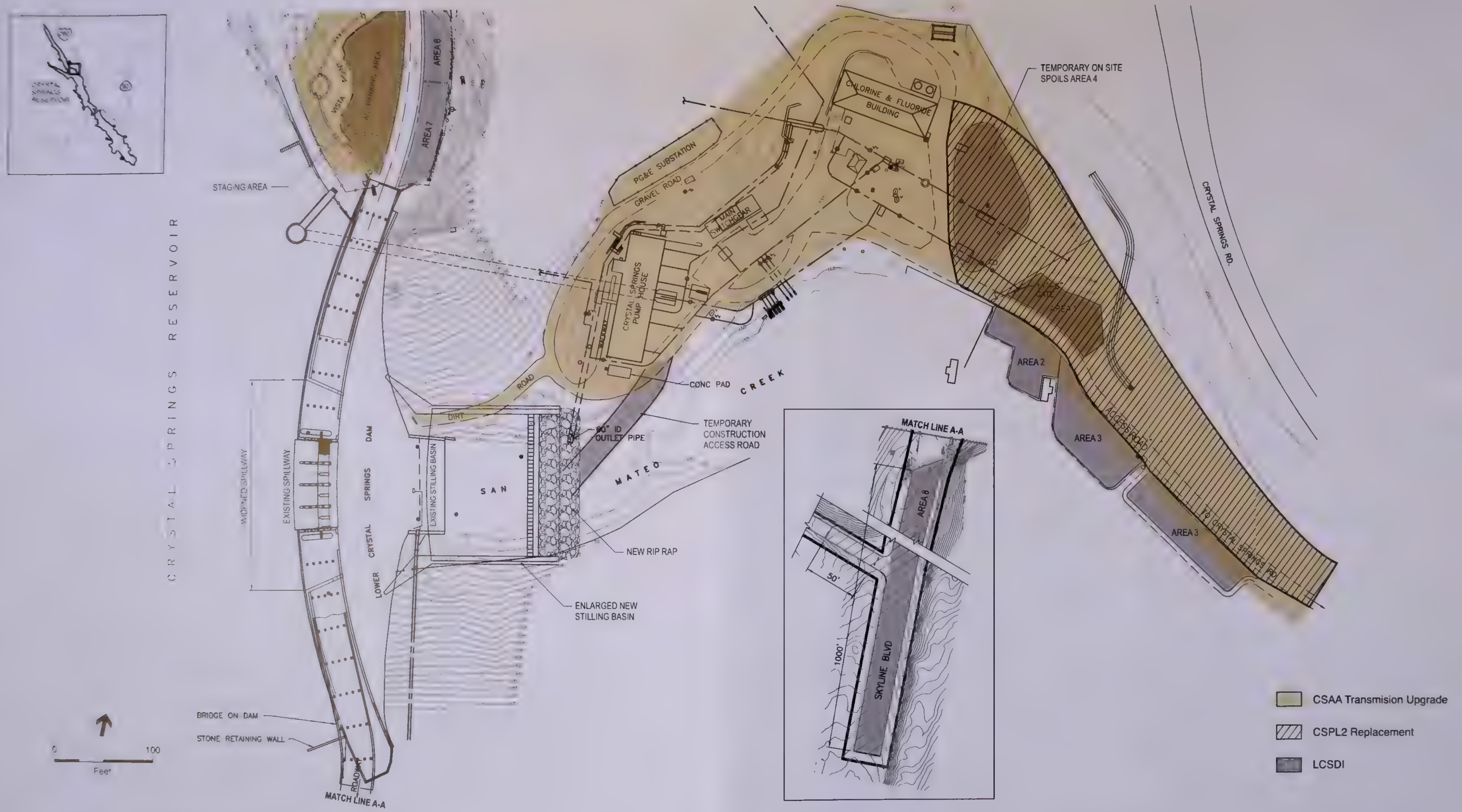
It should be noted that the potential for concurrent construction activities could vary if the construction duration were extended or delayed, or if the scheduling of CSPL2 construction sites were modified due to changes in timing or circumstances. For example, if CSPL2 Sites 1 and 2 were constructed one year earlier (2011), then the pipeline replacement work at CSPL2 Sites 1 and 2 would overlap with both the CSSA and LCSDI projects. Construction activities at Site 1 are projected to occur over a 70-day construction period, while construction activities at Site 2 are projected to occur over a 50-day construction period. Depending on the degree of overlap between these projects, an indirect cumulative effect could be an extended duration of



SOURCE: URS, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.1-3
Overlapping Construction Zones for Cumulative Projects in LCSD Vicinity



SOURCE: URS, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.1-3
Overlapping Construction Zones for Cumulative Projects in LCSD Vicinity

construction in the LCSD/Crystal Springs Road vicinity or an increase in the intensity of construction activities. This would result in cumulative construction-related impacts, primarily on traffic, noise, air quality, recreational resources, and biological resources in this vicinity.

For the purpose of the LCSDI cumulative analysis, it is assumed that the construction activities at CSPL2 Sites 1 and 2 would occur in 2011 and would overlap with the LCSDI project, which is the worst-case scenario (see Figure 3-10 in Chapter 3, Project Description).

PG&E Jefferson-Martin Transmission Line Project

The majority of this project is complete; however, a segment of the 230-kilovolt (kV) transmission line awaits permanent installation in the new Skyline Boulevard Bridge (a temporary overhead transmission line is in place until the remaining portion can be installed within the bridge). This segment would be installed during construction of the new bridge by San Mateo County. Although the duration of construction activities associated with permanently installing the transmission line in the new bridge is unknown at this time, it is assumed that construction would take approximately two to four months. Impacts related to installation of the transmission line would be temporary and would primarily be related to construction activities, although there would be long-term beneficial impacts on visual resources.

New Crystal Springs Bypass Tunnel Project

The SFPUC approved the NCSBT project on July 22, 2008 (SFPUC Resolution No. 08-0134). Construction activities associated with the LCSDI project would overlap in 2011 with the NCSBT project activities at the south shaft (on Polhemus Road), which is currently under construction. Work at the north shaft of the bypass tunnel on Crystal Springs Road (near Polhemus Road) is currently underway and is projected to be complete by early 2011. Construction work at the north tunnel shaft would not involve temporary lane closures. However, since Crystal Springs Road is the only access road to the toe of the dam, there is the potential for cumulative impacts on traffic, noise, and air quality, with associated effects on land use and recreation.

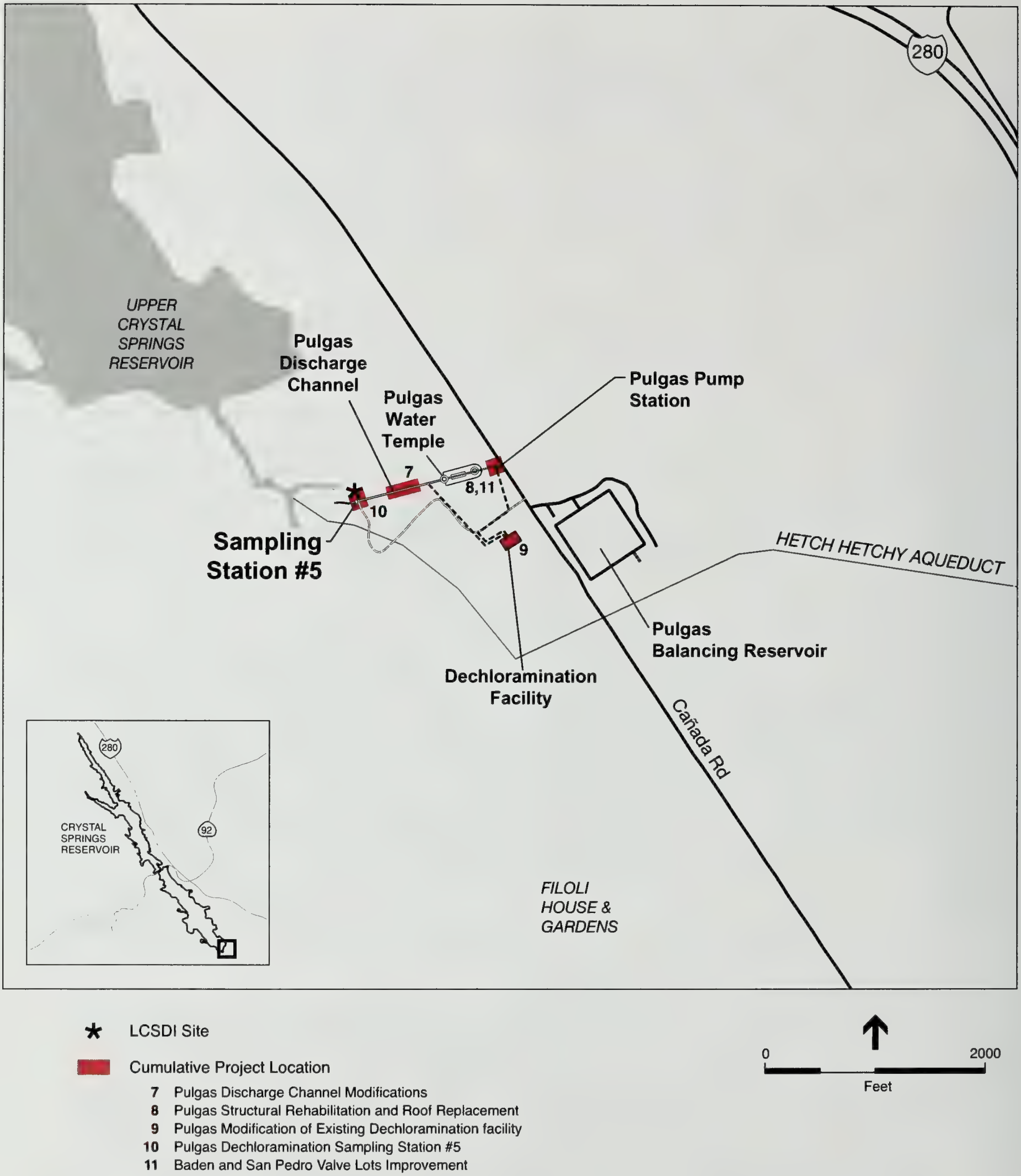
5.1.4.3 Cumulative Projects in Proximity to Sampling Station #5

Pulgas Discharge Channel Modifications Project

The SFPUC approved the Pulgas Discharge Channel Modifications project on November 12, 2008 (SFPUC Resolution No. 08-0203). This project will involve improvements to the existing discharge channel. Sampling Station #5, which would be modified as part of the LCSDI project, is an integrated piece of the Pulgas Discharge Channel (see **Figure 5.1-4**). The Pulgas Discharge Channel Modifications project would have overlapping construction schedules with the proposed project and would have overlapping haul routes on major highways, such as Interstate 280 (I-280) and Highway 92, which could temporarily increase traffic volumes on the local roadways.

Pulgas Structural Rehabilitation and Roof Replacement Project

The SFPUC approved the Pulgas Structural Rehabilitation and Roof Replacement project on June 9, 2009 (SFPUC Resolution No. 09-0097). This project would be located at the Pulgas Pump


280
UPPER CRYSTAL SPRINGS RESERVOIR
Pulgas Discharge Channel
Pulgas Water Temple
Pulgas Pump Station
7
8,11
10
9
Sampling Station #5
HETCH HETCHY AQUEDUCT
Pulgas Balancing Reservoir
Dechloramination Facility
Cañada Rd
FILOLI HOUSE & GARDENS
280
CRYSTAL SPRINGS RESERVOIR
92
* LCSDI Site
🟥 Cumulative Project Location
7 Pulgas Discharge Channel Modifications
8 Pulgas Structural Rehabilitation and Roof Replacement
9 Pulgas Modification of Existing Dechloramination facility
10 Pulgas Dechloramination Sampling Station #5
11 Baden and San Pedro Valve Lots Improvement
0
2000
Feet

SOURCE: ESA + Orion, 2009

Figure 5.1-4
Cumulative Projects in Sampling Station #5 Vicinity

Station, just east of Sampling Station #5 (see Figure 5.1-4). It is expected that construction of this project will be completed by July 2011; therefore, the schedule overlap with the LCSDI project would be minimal. Both projects would have similar construction haul routes, including Cañada Road, I-280, and Highway 92.

Pulgas Modification of Existing Dechloramination Facility Project

This facility is located in the same area as Sampling Station #5 (see Figure 5.1-4), and construction activities would overlap with those of the proposed project. Specifically, this project and the proposed project would share construction haul routes, including Cañada Road, I-280, and Highway 92.

Baden and San Pedro Valve Lots Improvement Project

The SFPUC approved the Baden and San Pedro Valve Lots Improvement Project on October 14, 2008 (SFPUC Resolution No. 08-0181). This project involves construction activities at the Pulgas Pump Station, which is located immediately east of the Pulgas Water Temple (in the same vicinity as Sampling Station #5) and would utilize the same staging area and construction haul routes as the LCSDI project.

5.1.4.4 Cumulative Projects in Proximity to Crystal Springs Reservoir

Habitat Reserve Program

The SFPUC is developing a Habitat Reserve Program (HRP) to comprehensively mitigate the environmental effects of multiple WSIP projects. The proposed HRP designates several sites in the Peninsula watershed for habitat restoration or creation, including sites along the eastern banks of Crystal Springs Reservoir (located from one to four miles south of the LCSD) and sites at the southern tip of Crystal Springs Reservoir (near the sampling station on the Pulgas Discharge Channel). In addition, there are proposed HRP sites located across the reservoir from the Lower Crystal Springs Dam site. The HRP projects could have overlapping staging areas and/or haul routes with those identified for the proposed project. In addition, there is a potential for cumulative effects on biological, recreational, or visual resources.

TABLE 5.1-1
CUMULATIVE PROJECTS AND IMPACTS IN OR NEAR THE LOWER CRYSTAL SPRINGS DAM IMPROVEMENTS PROJECT

Map Key	Lead Agency	Project Name	Project Description	Potential Cumulative Impact Topics	Approximate Distance to Project Site	Potentially Affected Project Components/ Areas of Overlap[a]	Estimated CEQA/ Construction Schedule
1	San Mateo County	San Mateo County Crystal Springs Dam Bridge Replacement	Seismic replacement of the bridge on Crystal Springs Road extending across the crest of the LCSD. The existing bridge was built in 1924; replacement is required in order to provide a structurally and seismically sound bridge (one that is able to withstand the Maximum Credible Earthquake). The new bridge would also provide a connection to trails that exist on both sides of the bridge. The new concrete and steel-reinforced bridge would be widened from 33 feet to 51.5 feet and lengthened from 608 feet to 612.5 feet. The bridge would include: • Two 12-foot vehicle travel lanes • 4-foot paved shoulder on each side • 15-foot multipurpose paved trail on the western side The new bridge would consist of seven spans. The superstructure would include a cast-in-place, post-tensioned concrete box-girder. The box-girder would have an average depth of 4 feet through the entire length. The new bridge would be supported on the LCSD, while the bridge abutments would be supported on the slopes above the dam and would be founded on rock formation with spread footings. The support system would also include a series of six bent column locations along the length of the bridge, each having 2 columns, for a total of 12 columns. (San Mateo County, 2009a)	Construction-related traffic impacts on access roads and associated air quality and noise impacts; sensitive habitats and species; water quality; aesthetics; recreation; geology; public services; and wildland fire hazards. Long-term aesthetics impacts.	Project located above the LCSD	LCSD; staging areas on Skyline Boulevard; use of Highway 92 and I-280	**Status of environmental review:** Mitigated Negative Declaration (MND) published in 2009 Demolition of existing bridge: 6 months beginning fall 2010 **Construction schedule:** 12 months beginning summer 2012

TABLE 5.1-1 (Continued)
CUMULATIVE PROJECTS AND IMPACTS IN OR NEAR THE LOWER CRYSTAL SPRINGS DAM IMPROVEMENTS PROJECT

Map Key	Lead Agency	Project Name	Project Description	Potential Cumulative Impact Topics	Approximate Distance to Project Site	Potentially Affected Project Components/ Areas of Overlap[a]	Estimated CEQA/ Construction Schedule
2	CCSF (SFPUC)	Crystal Springs/ San Andreas Transmission Upgrade	Seismic improvements of facilities that convey water from Crystal Springs Reservoir to the Harry Tracy Water Treatment Plant (WTP). This project would increase the transmission capacity of raw water from Crystal Springs Reservoir to San Andreas Reservoir to reliably supply 140 million gallons per day of raw water for treatment at the Harry Tracy WTP. The project would include: • Seismic and functional upgrades to the upper and lower culverts at Upper Crystal Springs Dam culverts. Improvements include installation of isolation devices at both culverts that run through the Upper Crystal Springs Dam. • Seismic retrofit and hydraulic upgrade of the Crystal Springs Outlet Structures 1 and 2 and tunnels located immediately northwest of the LCSD; these improvements would also ensure their continued operation following an earthquake. • Replacement of the Crystal Springs Pump Station. • Upgrade of the emergency direct delivery system at Crystal Springs Pump Station, including upgrade of the emergency chlorine chemical feed system. • Improvements to the Crystal Springs/ San Andreas (CSSA) Pipeline, including general relining of the pipeline;	Construction-related traffic impacts on access roads and associated air quality and noise impacts; aesthetics; recreation; water quality; and sensitive habitats and species. Long-term impacts on historic resources, and aesthetics	Project located at the LCSD vicinity	LCSD; staging areas on Crystal Springs Road and Skyline Boulevard; use of Highway 92 and I-280	**Status of environmental review:** Notice of Preparation (NOP) issued in February 2008; preparation of Draft EIR underway **Construction schedule:** Fall 2010 through fall 2013

TABLE 5.1-1 (Continued)
CUMULATIVE PROJECTS AND IMPACTS IN OR NEAR THE LOWER CRYSTAL SPRINGS DAM IMPROVEMENTS PROJECT

Map Key	Lead Agency	Project Name	Project Description	Potential Cumulative Impact Topics	Approximate Distance to Project Site	Potentially Affected Project Components/ Areas of Overlap[a]	Estimated CEQA/ Construction Schedule
2 (cont.)			construction and improvement of access roads along the CSSA Pipeline; replacement of the first 1,100 feet of the pipeline starting at the Crystal Springs Pump Station; replacement of the final 1,500 feet of pipeline and inlet to San Andreas Reservoir; and replacement of pipeline appurtenances such as air vacuum and blowoff valves and manhole access risers. • Seismic and hydraulic upgrade and repair of the San Andreas Outlet Structures 2 and 3 located on the eastern bank of San Andreas Reservoir. • Addition of fish screens on the outlet structures for both Crystal Springs and San Andreas Reservoirs (San Francisco Planning Department, 2009b).				
3	California Public Utilities Commission	PG&E Jefferson-Martin Transmission Line	The Jefferson-Martin project involved the installation of a new approximately 27-mile 230-kV transmission line from the Jefferson Substation (in San Mateo County near the town of Woodside) to the Martin Substation (in the city of Brisbane). Approximately 24 miles of the 230-kV transmission line was constructed underground and approximately three miles was constructed overhead. The project was installed in five segments. Segment 1 includes a temporary overhead crossing at the LCSD until it can be installed in the roadway of the reconstructed Skyline Boulevard Bridge. (CPUC, 2009) The mitigation monitoring program for this project included restoration of	Construction-related sensitive habitats and species; aesthetics; wildland fire hazards; air quality	Project located at the LCSD vicinity	LSCD	**Status of environmental review:** Final EIR completed and certified in 2006 **Construction schedule:** 2006 Project completed (except for the permanent installation of transmission lines within the Skyline Boulevard Bridge, estimated to be 2012-2013)

TABLE 5.1-1 (Continued)
CUMULATIVE PROJECTS AND IMPACTS IN OR NEAR THE LOWER CRYSTAL SPRINGS DAM IMPROVEMENTS PROJECT

Map Key	Lead Agency	Project Name	Project Description	Potential Cumulative Impact Topics	Approximate Distance to Project Site	Potentially Affected Project Components/ Areas of Overlap[a]	Estimated CEQA/ Construction Schedule
3 (cont.)			wetlands, sensitive habitats, and special-status species along the eastern portion of Crystal Springs Reservoir. The transmission line was completed in April 2006, with the majority of mitigation completed by August 2006. (Aspen, 2006)				
4	CCSF (SFPUC)	Crystal Springs Pipeline No. 2 Replacement	Repair and replacement of 5.1 miles of the existing CSPL2 to improve seismic reliability and address security concerns. Repair and replacement of the pipeline would begin at the Crystal Springs Pump Station and move north along Crystal Springs Road, El Camino Real, and other roads to the University Mound area. Of the 19 replacement segments, only 7 sites are in the vicinity of the LCSDI project area: Site 1: Replacement of 1,700 feet of pipeline south of or in Crystal Springs Road, between I-280 overpass and Polhemus Road (near the Crystal Springs Pump Station). Site 2: Replacement of 760 feet of pipeline in and south of Crystal Springs Road, between I-280 overpass and Polhemus Road. Site 3: Replacement of 320 feet of pipeline west of Crystal Springs Road between Polhemus Road and Tartan Trail Road. Site 4: The project component involves security improvements, and no excavation would occur.	Construction-related recreation; traffic; air quality, noise, sensitive habitats and species; water quality; wildland fire hazards; and energy resources	The southern end of the alignment is located at the LCSD vicinity	Construction truck traffic west of I-280; staging areas near Crystal Springs Pump Station	**Status of environmental review:** NOP issued November 2008; preparation of Draft EIR underway **Construction schedule:** Summer 2011 for installation of tee and isolation valves at Site 2; either summer 2011 or summer 2012 for pipeline replacement at Sites 1 and 2

TABLE 5.1-1 (Continued)
CUMULATIVE PROJECTS AND IMPACTS IN OR NEAR THE LOWER CRYSTAL SPRINGS DAM IMPROVEMENTS PROJECT

Map Key	Lead Agency	Project Name	Project Description	Potential Cumulative Impact Topics	Approximate Distance to Project Site	Potentially Affected Project Components/ Areas of Overlap[a]	Estimated CEQA/ Construction Schedule
4 (cont.)			Site 5: Replacement of 150 feet of pipeline east of Crystal Springs Road and south of Woodridge Road, crossing San Mateo Creek. Site 6: Replacement of 200 feet of pipeline east of Crystal Springs Road and south of Woodridge Road, across San Mateo Creek. Site 7: Replacement of 200 feet of pipeline east of the Crystal Springs Road/Crystal Springs Terrace intersection. (San Francisco Planning Department, 2008c)				
5	CCSF (SFPUC)	New Crystal Springs Bypass Tunnel	Construction of a new tunnel to replace the existing pipeline to convey drinking water from the Hetch Hetchy system to northern San Mateo County and San Francisco customers. The project will increase seismic and delivery reliability and will include construction of: • A new 4,200-foot-long, 8-foot-diameter tunnel • A north access shaft approximately 18 feet in diameter and about 60 feet deep • A south access shaft 30 feet in diameter and 165 feet deep • Tie-ins to the Sunset Supply Pipeline, CSPL2, and the existing Crystal Springs Bypass Pipeline and existing Crystal Springs Bypass Tunnel • A new emergency generator (20-kilowatt) and propane tank at vault G40 along Polhemus Road (San Francisco Planning Department, 2007a)	Construction-related traffic on local access roads and associated air quality and noise impacts; recreation; sensitive habitats and species; wildland fire hazards; and visual impacts	Approximately 0.75 mile east of LCSD	Construction truck traffic west of I-280	**Status of environmental review**: Final EIR completed and certified on June 5, 2008 **Construction schedule:** Began in December 2008. North shaft expected to be completed by spring 2011 and south shaft expected to be completed by fall 2011.

TABLE 5.1-1 (Continued)
CUMULATIVE PROJECTS AND IMPACTS IN OR NEAR THE LOWER CRYSTAL SPRINGS DAM IMPROVEMENTS PROJECT

Map Key	Lead Agency	Project Name	Project Description	Potential Cumulative Impact Topics	Approximate Distance to Project Site	Potentially Affected Project Components/ Areas of Overlap[a]	Estimated CEQA/ Construction Schedule
6	CCSF (SFPUC)	Habitat Reserve Program	Preservation, enhancement, restoration, and creation of habitat to compensate for impacts of WSIP projects on biological resources within the San Joaquin Valley, the Alameda watershed, and the Peninsula watershed. The HRP includes about 14 sites in the area near Crystal Springs Reservoir (see No. 6 on Figure 5.1-1), including: • Preservation and enhancement of up to 4 acres of serpentine grasslands • Creation of up to 120 acres of annual grasslands for the protection of San Francisco garter snake and California red-legged frog • Preservation and enhancement of up to 70 acres of coastal scrub for protection of San Francisco garter snake • Creation of up to 70 acres of oak woodlands for the protection of San Francisco garter snake and California red-legged frog • Enhancement of up to 10 acres of riparian habitat for the protection of San Francisco garter snake and California red-legged frog • Enhancement of up to 100 acres of seasonal wetlands for the protection of San Francisco garter snake and California red-legged frog (San Francisco Planning Department, 2007b)	Construction-related traffic impacts on access roads and associated air quality and noise impacts; sensitive habitats and species; water quality; wildland fire hazards; air quality; energy resources. Long-term impacts on aesthetics.	Several HRP projects within 0.5 mile of LCSD and several within 0.5 mile of Sampling Station #5	Within the possible inundation area; construction truck traffic west of I-280	**Status of environmental review:** NOP issued July 2007; preparation of Draft EIR underway **Construction schedule:** 2010 through 2013

TABLE 5.1-1 (Continued)
CUMULATIVE PROJECTS AND IMPACTS IN OR NEAR THE LOWER CRYSTAL SPRINGS DAM IMPROVEMENTS PROJECT

Map Key	Lead Agency	Project Name	Project Description	Potential Cumulative Impact Topics	Approximate Distance to Project Site	Potentially Affected Project Components/ Areas of Overlap[a]	Estimated CEQA/ Construction Schedule
7	CCSF (SFPUC)	Pulgas Discharge Channel Modifications	Modifications to the existing Pulgas Discharge Channel to improve the structural integrity of the discharge channel and to accommodate an anticipated maximum peak flow of 250 million gallons per day. Project components include: • Increasing the height of the channel walls by 3 feet near the outlet structure and 1 foot at the remaining portions • Repairing cracks in the channel and corrosion of exposed reinforcing steel • Tying segregated channel sections across continuous joints/cracks using wall and slab stitching • Installing struts on the tall, tapered wall at eastern end of the channel • Replacing a broken subdrain pipe, which diverges from the channel close to western end (San Francisco Planning Department, 2008a)	Construction-related traffic impacts on access roads and associated air quality and noise impacts; sensitive habitats and species; water quality; wildland fire hazards; energy resources	Project located at Pulgas Discharge Channel, immediately next to Sampling Station #5	Use of Skyline Boulevard, Cañada Road, I-280	**Status of environmental review:** Mitigated Negative Declaration completed October 2008 **Construction schedule:** July 2009 through fall 2011
8	CCSF (SFPUC)	Pulgas Structural Rehabilitation and Roof Replacement	Structural rehabilitation of the reservoir, including seismic retrofitting of the walls, installation of a new steel frame roof, and repair of concrete cracks and exposed reinforcing steel. (San Francisco Planning Department, 2009a)	Construction-related traffic impacts on access roads and associated air quality and noise impacts; sensitive habitats and species; water quality; wildland fire hazards; energy resources; recreation	Project located at Sampling Station #5 vicinity; within landscaped area of Pulgas Water Temple	Use of Skyline Boulevard, Cañada Road, and I-280	**Status of environmental review:** Mitigated Negative Declaration completed April 2009 **Construction schedule:** October 2009 through fall 2011

TABLE 5.1-1 (Continued)
CUMULATIVE PROJECTS AND IMPACTS IN OR NEAR THE LOWER CRYSTAL SPRINGS DAM IMPROVEMENTS PROJECT

Map Key	Lead Agency	Project Name	Project Description	Potential Cumulative Impact Topics	Approximate Distance to Project Site	Potentially Affected Project Components/ Areas of Overlap[a]	Estimated CEQA/ Construction Schedule
9	CCSF (SFPUC)	Pulgas Modification of Existing Dechloramination Facility	Improvements to the dechloramination and pH control facilities to address immediate compliance issues. Emphasis placed on chlorine removal and pH adjustment. (SFPUC, 2009b)	Construction-related traffic impacts on access roads and associated air quality and noise impacts; sensitive habitats and species; water quality; wildland fire hazards; air quality; energy resources	Project located at Sampling Station #5 vicinity; just south of Pulgas Water Temple parking lot and along Cañada Road	Use of Skyline Boulevard, Canada Road, and I-280	**Status of environmental review:** Addendum to Hetch Hetchy Water Treatment Chloramine Conversion Project Final Environmental Impact Report, Certified October 19, 2000 **Construction schedule:** Summer 2010 through winter 2011
10	CCSF (SFPUC)	Pulgas Dechloramination Sampling Station # 5	Installation of a new prefabricated sampling station over the existing channel to test chloramine residual before discharging treated water to Upper Crystal Springs Reservoir. (SFPUC, 2009c)	Construction-related impacts on traffic; noise; biological resources; water quality; energy	Project located at Sampling Station #5 project site	Use of Skyline Boulevard, Cañada Road, and I-280	Completed in 2007
11	CCSF (SFPUC)	Baden and San Pedro Valve Lots Improvement Project	Replacement of an isolation valve at the Pulgas Pump Station; stabilization of slope and construction of drainage improvements at the Pulgas Tunnel Air Shaft. Improvements are also planned at the Baden and San Pedro Valve Lots, but these facilities are not located in or near the Peninsula watershed. (SFPUC, 2009a)	Construction-related traffic impacts on access roads and associated air quality and noise impacts; sensitive habitats and species; water quality; wildland fire hazards; energy resources; recreation	Relevant project components located at Sampling Station #5 vicinity; within landscaped area of Pulgas Water Temple	Use of Skyline Boulevard, Cañada Road, and I-280	**Status of environmental review:** MND certified on September 25, 2008 **Construction schedule:** June 2009 through spring 2011

TABLE 5.1-1 (Continued)
CUMULATIVE PROJECTS AND IMPACTS IN OR NEAR THE LOWER CRYSTAL SPRINGS DAM IMPROVEMENTS PROJECT

Map Key	Lead Agency	Project Name	Project Description	Potential Cumulative Impact Topics	Approximate Distance to Project Site	Potentially Affected Project Components/ Areas of Overlap[a]	Estimated CEQA/ Construction Schedule
12	CCSF (SFPUC)	Polhemus Creek Restoration	Restoration of Polhemus Creek along Polhemus Road. Rock fill that was placed in the creek on an emergency basis in 1996 would be removed and the creekbed area restored (San Francisco Planning Department, 2007a). This project is complete.	Construction-related and long-term impacts on sensitive habitats and species	1 mile southeast of LCSD	Highway 92 and Polhemus Road; however, project is complete	**Status of environmental review:** Mitigated Negative Declaration completed in May 2006 **Construction schedule:** Completed in 2007, however, monitoring and revegetation efforts are ongoing for 10 years.
13	CCSF (SFPUC)	Harry Tracy Water Treatment Plant Long Term Improvements	Improve delivery reliability and provide seismic upgrades. Seismic retrofit and rehabilitation of the existing building and facility to provide long-term reliability and process improvements. Increase sustained treatment capacity of plant from 120 to 140 mgd for 60 days. Proposed improvements include: • Replacement and upgrade of ozone generation system for primary disinfection • Replacement or upgrade of existing sedimentation basins at same location • Improvements to sludge handling facilities • New, redundant pipeline from treatment works to finished water storage reservoir	Construction-related traffic impacts and associated air quality and noise impacts; sensitive habitats and species; water quality; energy resources	6 miles north of LCSD along I-280	Use of I-280	**Status of environmental review:** NOP issued May 2008 **Construction schedule:** 2011 - 2013

TABLE 5.1-1 (Continued)
CUMULATIVE PROJECTS AND IMPACTS IN OR NEAR THE LOWER CRYSTAL SPRINGS DAM IMPROVEMENTS PROJECT

Map Key	Lead Agency	Project Name	Project Description	Potential Cumulative Impact Topics	Approximate Distance to Project Site	Potentially Affected Project Components/ Areas of Overlap[a]	Estimated CEQA/ Construction Schedule
13 (cont.)			• Raw water pump station improvements Upgrade and replacement of electrical and instrumentation components, including improvements to process and plant security facilities (SFPUC, 2010).				
14	San Mateo County	Highland Estates Residential Development Project	Development of a small residential parcel and an approximately 97-acre open space parcel into 11 residential lots and remaining open space. Project would be located between Bunker Hill Drive to the north and northeast; Polhemus Road to the southeast; Ticonderoga Drive and Cobblehill Place to the south; and Ticondergoa Drive, Lexington Avenue, and Yorktown Road to the west. (San Mateo County, 2009b)	Construction-related traffic impacts on access roads and associated air quality and noise impacts	1.5 miles from LCSD	Construction truck traffic east of I-280	**Status of environmental review:** Draft EIR published in December 2008; Draft EIR expected to be recirculated in September 2009 **Construction schedule:** Expected to begin April 2010
15	San Mateo County	Ascension Heights Residential Development	Development of 25 single-family residential lots on a vacant parcel located at the southeast corner of Ascension Drive and Bel Aire Road. (San Mateo County, 2009c)	Construction-related traffic impacts on access roads and associated air quality and noise impacts	1 mile from LCSD	Construction truck traffic east of I-280	**Status of environmental review:** Draft EIR published in June 2009 **Construction schedule:** Building and phasing schedule has not been determined, but it is assumed that buildout would be completed in 4.5–5 years

TABLE 5.1-1 (Continued)
CUMULATIVE PROJECTS AND IMPACTS IN OR NEAR THE LOWER CRYSTAL SPRINGS DAM IMPROVEMENTS PROJECT

Map Key	Lead Agency	Project Name	Project Description	Potential Cumulative Impact Topics	Approximate Distance to Project Site	Potentially Affected Project Components/ Areas of Overlap[a]	Estimated CEQA/ Construction Schedule
16	San Mateo County	Crystal Springs Regional Trail Extension	Development of the northernmost portion of the existing Crystal Springs Regional Trail, located south of the bridge along Crystal Springs Reservoir. (San Mateo County, 2009a)	Construction-related traffic impacts and associated air quality and noise impacts; sensitive habitats and species; recreation; water quality	Project located at LCSD vicinity	To be determined	To be determined; this project is currently in the design phase

[a] Construction schedules for non-SFPUC projects were estimated based on information obtained in project-related documents such as initial studies and EIRs; city, county, and regional agency websites; and communication with representatives from local jurisdictions in May 2009. All other non-SFPUC planned or approved projects have been confirmed. However, as with all proposed development projects, estimated construction schedules are subject to revisions and delays and therefore could vary from the time periods indicated.

5.1.5 References

Aspen Environmental Group, *Final Report for the PG&E Jefferson-Martin 230 kV Transmission Line Project Mitigation Monitoring Program,* August 2006.

California Public Utilities Commission (CPUC), *Jefferson-Martin 230 kV Transmission Line Project website,* available online at http://www.cpuc.ca.gov/Environment/info/aspen/jefferson_martin/jeffmartin.htm, accessed June 2009.

San Francisco Planning Department, *New Crystal Springs Bypass Tunnel Environmental Impact Report,* August 2007a.

San Francisco Planning Department, *Habitat Reserve Program Notice of Preparation of an Environmental Impact Report and Notice of Public Scoping Meeting,* July 2007b.

San Francisco Planning Department. *Pulgas Discharge Channel Modifications Project Mitigated Negative Declaration,* October 2008a.

San Francisco Planning Department, *Final Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program,* File No. 2005.0159E, State Clearinghouse No. 2005092026, Certified October 30, 2008b.

San Francisco Planning Department. *Crystal Springs Pipeline No. 2 (CSPL2) Replacement Project Notice of Preparation of an Environmental Impact Report and Notice of Public Scoping Meeting,* November 2008c.

San Francisco Planning Department. *Pulgas Balancing - Structural Rehabilitation and Roof Replacement Project Notification of Project Receiving Environmental Review,* March 2009a.

San Francisco Planning Department. *Crystal Springs / San Andreas Transmission Upgrade Project Draft Environmental Impact Report.* November 2009b.

San Francisco Public Utilities Commission (SFPUC). *Baden and San Pedro Valve Lots Improvement, Project Website,* available online at http://sfwater.org/Project.cfm/MC_ID/35/MSC_ID/393/MTO_ID/649/PRJ_ID/222, accessed June 2009a.

San Francisco Public Utilities Commission (SFPUC), *Pulgas Balancing - Modification of Existing Dechloramination Facility, Project Website,* available online at http://sfwater.org/Project.cfm/MC_ID/35/MSC_ID/393/MTO_ID/649/PRJ_ID/153, accessed June 2009b.

San Francisco Public Utilities Commission (SFPUC), Personal communication with Chu Liu, San Francisco Public Utilities Commission, June 30, 2009c.

San Francisco Public Utilities Commission (SFPUC), Personal communication with Anna Roche, San Francisco Public Utilities Commission, January 28, 2010.

San Mateo County, *Crystal Springs Dam Bridge Replacement Project Initial Study with Proposed Mitigated Negative Declaration,* May 2009a.

San Mateo County, Personal communication with Dave Holbrook, Senior Planner, and Camille Leung, Senior Planner, San Mateo County Planning and Building Department, May 12, 2009b.

San Mateo County, Ascension Heights Subdivision Project Draft EIR, June 2009c.

5.2 Land Use

This section describes existing land uses in the vicinity of the Lower Crystal Springs Dam Improvements (LCSDI) project and evaluates the potential for implementation of the project to adversely affect established land uses or land use activities. The proposed project would involve modifying the existing Lower Crystal Springs Dam (LCSD) and raising the existing Sampling Station #5 to accommodate the proposed future reservoir operating levels. This impact analysis evaluates the potential land use impacts of the proposed project and identifies mitigation measures to avoid or reduce adverse impacts, as appropriate. The principal land use impacts associated with the proposed project would occur during construction activities.

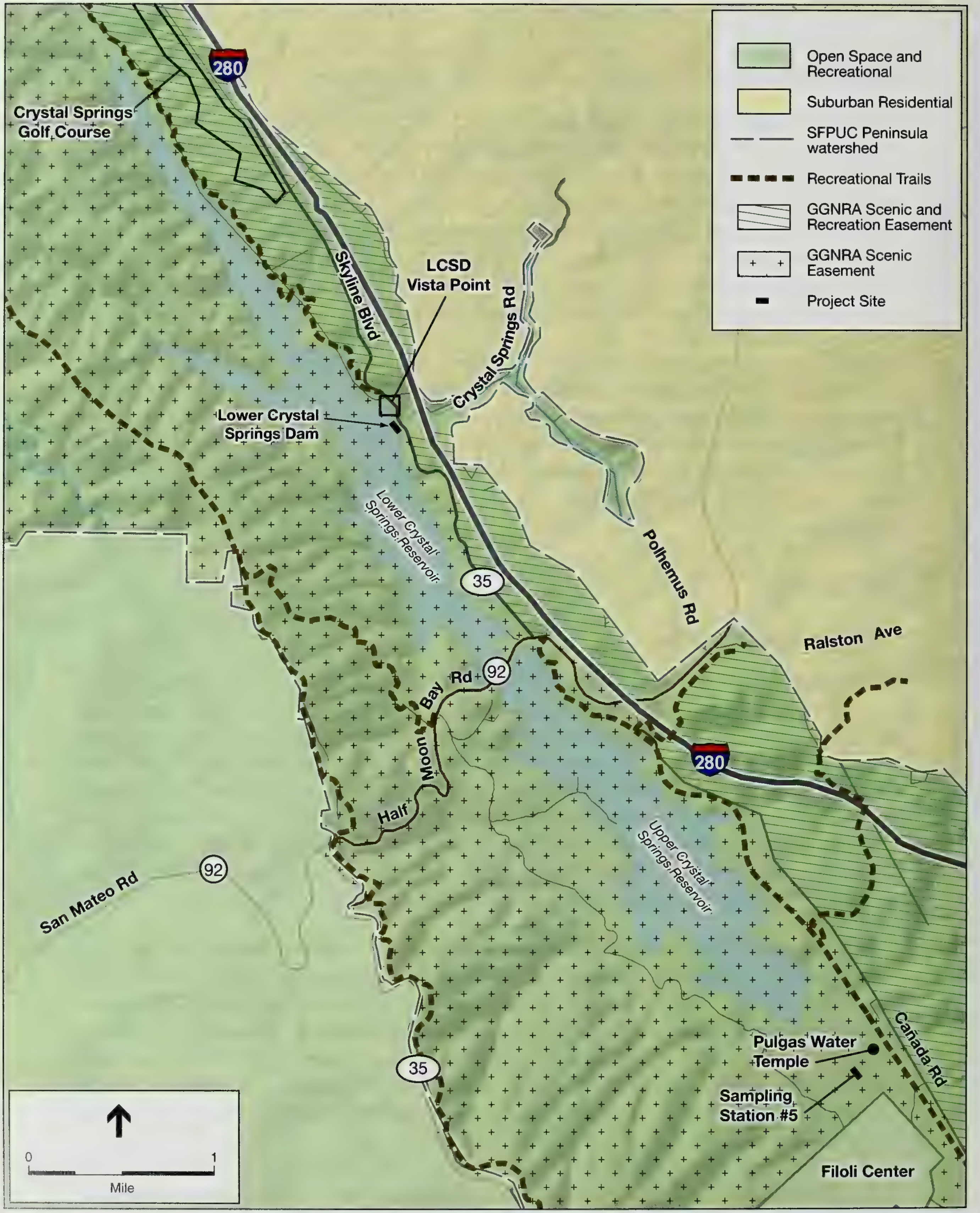
This land use section draws upon the analyses in Sections 5.6, Transportation and Circulation; 5.7, Noise and Vibration; 5.8, Air Quality; 5.10, Recreation, and 5.18, Agricultural Resources, in which the direct impacts on those resource areas are analyzed. The land use analysis synthesizes the direct impacts on traffic, noise, and air quality to determine overall land use impacts; impacts on recreational land uses are discussed in this section, since it is one of the major land uses in the project area, but the detailed analysis of recreational impacts is presented in Section 5.10, Recreation.

5.2.1 Setting

5.2.1.1 Existing Land Use

The proposed project, including project components at the LCSD and at Sampling Station #5, is located entirely within SFPUC Peninsula watershed lands in unincorporated San Mateo County (see **Figure 5.2-1**). The SFPUC Peninsula watershed encompasses 23,000 acres of open space lands that are used primarily for water collection, transmission, and storage. Except for SFPUC water supply facilities, groundskeepers' cottages, and ancillary structures, the Peninsula watershed is largely undeveloped and contains heavily forested vegetation on its western slopes and grassland and scattered woodlands on its eastern periphery. In addition to Upper and Lower Crystal Springs Reservoirs, SFPUC water storage facilities in the project vicinity include San Andreas and Pilarcitos Reservoirs, which are located north of the LCSDI project area.

A 19,000-acre Scenic Easement and a 4,000-acre Scenic and Recreation Easement overlay nearly all of the Peninsula watershed lands. The City and County of San Francisco (CCSF) granted these easements to the U.S. Department of the Interior, which are administered by Golden Gate National Recreation Area (GGNRA), but retains ownership and management of the watershed. The terms of the Scenic Easement are fairly restrictive with regard to access, except by the SFPUC for water utility-related purposes, whereas the Scenic and Recreation Easement allows for limited recreational activities that are compatible with water supply protection and preservation of the watershed as open space. The Peninsula watershed is also part of the Golden Gate Biosphere Reserve, which is a National Recreation Area designated by the U.S. Department of the Interior and administered by the National Park Service. Refer to Chapter 4, Plans and Policies, for additional discussion of the GGNRA easements and the Golden Gate International Biosphere Reserve.



SOURCE: ESA + Orion, 2009

SFPUC Lower Crystal Springs Dam Improvements . 207544.07

Figure 5.2-1

General Land Use in the Project Area

The project area is generally delineated by Interstate 280 (I-280), which extends in a north-to-south direction along the eastern fringe of the Peninsula watershed. The majority of urban and suburban development in San Mateo County occurs east of I-280; land use in the unincorporated areas west of I-280 is dominated by open space and rural residential uses. Highway 92, which connects the cities of San Mateo and Half Moon Bay, bisects the watershed between Upper and Lower Crystal Springs Reservoirs. Skyline Boulevard extends along the eastern side of Lower Crystal Springs Reservoir and the western side of Upper Crystal Springs Reservoir, crossing lower San Mateo Creek at the Skyline Boulevard Bridge, which is supported on piers above the LCSD. Nearby incorporated areas include the town of Hillsborough and the cities of San Mateo, Belmont, and San Carlos, all of which are located east of I-280 and the LCSDI project area.

Due to the sensitivity of certain land uses to construction-related effects, this analysis identifies existing residences, schools, recreational resources, and other publicly accessible facilities within one mile of the LCSD and Sampling Station #5 project sites. Although land uses closest to the construction zone are the most likely to be adversely affected by construction-related noise increases, traffic congestion, and air emissions, land uses located farther from the project site can be also affected by construction-related road closures, traffic, and impeded vehicular access within the project area.

Lower Crystal Springs Dam Vicinity

Existing land uses in the LCSD vicinity include recreational, residential, and educational/club facilities. Recreational uses include outdoor activities such as picnicking, walking, hiking, running, biking, horseback riding, and golf. Nearby recreational trails and facilities include a vista point and the southern terminus of the Sawyer Camp Trail, both located just north of the LCSD at the Skyline Boulevard/Crystal Springs Road junction; designated bikeways[1] along Crystal Springs Road and Polhemus Road; and the Crystal Springs Golf Course, located approximately one mile to the north of the dam. (See Section 5.10 Recreation, for additional information regarding recreational resources in the project area.) There are suburban residential uses in the LCSD vicinity east of I-280. The closest residences are located at Berryessa Way in the town of Hillsborough, approximately 1,000 feet northeast of the base of LCSD, and on Laurel Hill Drive in the unincorporated San Mateo Highlands neighborhood, approximately 1,450 feet to the east. The nearest schools to the LCSD are the Odyssey School on Polhemus Road, approximately 4,000 feet to the northeast, and Highlands Elementary on Bunker Hill Drive, approximately 3,500 feet to the southeast. The Crystal Springs 4-H Club Farm, which is part of the University of California's 4-H Youth Development Program, is located off of Skyline Boulevard, just north of the Crystal Springs Road junction. There are no churches or medical facilities within one mile of the LCSD site.

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[1] The City/County Association of Governments of San Mateo County classifies bicycle routes in the project area based on the bikeway classifications defined by the State of California in the California Streets and Highway Code, Section 890.4. See Sections 5.6, Transportation and Circulation, and 5.10, Recreation, for additional information regarding designated bikeways.

Sampling Station #5 Vicinity

Sampling Station #5 is located off of Cañada Road and just west of the Pulgas Water Temple, approximately four miles south of the LCSD. The proposed construction and staging areas for Sampling Station #5 are not publicly accessible and are largely hidden from public view by trees and landscaping. Land uses in the immediate vicinity of Sampling Station #5 consist of the Pulgas Water Temple and other SFPUC water system facilities, including a dechloramination facility, balancing reservoir, and pump station, which are surrounded by largely undeveloped watershed lands and open space. The Pulgas Water Temple, owned and operated by the SFPUC, is open to the public and provides recreational uses in a unique, park-like setting; it can also be reserved for special events such as weddings on Saturdays between April and October. The Filoli Center, a private estate owned and managed by the National Trust for Historic Preservation, is located approximately 0.5 mile south of Sampling Station #5 and is open to the public for tours. Other nearby recreational facilities and trails include the Crystal Springs Trail South along the west shoulder of Cañada Road; the Pulgas Ridge Regional Open Space Preserve, approximately one mile to the southeast; and Cañada Road, which is a designated bikeway. See Section 5.10, Recreation, for additional information on recreational resources in the project area. There are no residences, schools, churches, or medical facilities within one mile of Sampling Station #5.

5.2.2 Regulatory Framework

5.2.2.1 Federal Regulations

There are no federal land use regulations that apply to the proposed project. As discussed in Chapter 4, Plans and Policies, the SFPUC retains the right to construct, repair, and improve SFPUC water utilities under both the federal GGNRA Scenic Easement and Scenic and Recreation Easement, and on CCSF-owned Peninsula watershed lands located within the Golden Gate Biosphere Reserve.

5.2.2.2 State Regulations

There are no state land use regulations that apply to the proposed project. SFPUC water utility-related activities in the Peninsula watershed are not subject to the provisions of the State Fish and Game Refuge designation (see Chapter 4, Plans and Policies, for further description of this designation).

5.2.2.3 Local Regulations

There are no local land use regulations that apply to the proposed project. Under California Government Code Section 53090 et seq., the SFPUC receives intergovernmental immunity from the zoning and building ordinances of cities and counties pertaining to land use. Refer to Chapter 4, Plans and Policies, for more information concerning intergovernmental immunity and the applicability of local land use plans, policies, and regulations to the project.

5.2.3 Impacts and Mitigation Measures

5.2.3.1 Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to land use, but generally considers that implementation of the proposed project would have a significant impact if it were to:

- Physically divide an existing community;
- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect;
- Have any substantial impact on the existing character of the vicinity; or
- Substantially disrupt or displace existing land uses or land use activities.

Impacts related to the following significance criteria are not discussed for the reasons described below:

- *Physically Divide an Established Community.* The proposed project would involve improvements and modifications to an existing dam structure and water quality sampling station. The project site is located outside of urbanized areas; therefore, the project would not physically divide an established community. This significance criterion is *not applicable* to the proposed project.

- *Conflict with Applicable Land Use Plans, Policies, or Regulations.* This criterion is evaluated in Chapter 4, Plans and Policies.

- *Have a Substantial Impact Upon the Existing Character of the Vicinity.* Potential impacts on the land use character in the project vicinity would occur if the project resulted in a long-term change in land use that would be incompatible or conflict with established land uses. After completion of project improvements, the SFPUC would continue to operate the dam, reservoir, and water sampling station at their existing locations on CCSF-owned watershed lands in essentially the same manner as current operations. The major difference in proposed operations from current operations would be the increased average annual water storage, which would be similar to historical reservoir operations prior to the DSOD restrictions. For this reason, the project would not substantially alter the existing land use character in the vicinity; therefore, this significance criterion is *not applicable* to the proposed project.

5.2.3.2 Approach to Analysis

The analysis of land use impacts focuses on the LCSDI project's potential to substantially disrupt or displace existing land uses or land use activities. Implementation and operation of the proposed project would not result in any permanent changes to land uses or land use activities because: (a) the LCSDI project components are existing water system facilities and would continue to be used for this purpose under the proposed project; and (b) the post-construction operations of Crystal Springs Reservoir would be similar to current operations, except that average annual water storage and water surface elevations would both increase, (this increase would be similar to historical operations and would not displace, inundate, or otherwise alter existing land uses). Thus, the proposed project would result in temporary, indirect impacts on land use during construction, rather than long-term or permanent changes in land use due to project siting or operation.

Construction activities could generate a combination of physical effects—including dust and exhaust emissions, increased noise levels, temporary detours related to the closure of a 1,300-foot section of Skyline Boulevard, increased traffic congestion and hazards—that could indirectly disturb or disrupt land uses or land use activities in the vicinity of the project construction sites and staging areas. The direct physical impacts related to each of these topics are discussed separately in Sections 5.6, Transportation and Circulation; 5.7, Noise and Vibration; and 5.8, Air Quality. This land use analysis assesses the temporary land use disruption resulting from the combination of the residual traffic, noise, and air quality effects (after mitigation measures are applied) in terms of indirect land use disruption effects. Although this analysis considers recreational land uses in the project area, potential impacts specific to recreational resources are evaluated in greater detail in Section 5.10, Recreation.

5.2.3.3 Impact Summary

Table 5.2-1 provides a summary of potential land use impacts.

TABLE 5.2-1
SUMMARY OF IMPACTS – LAND USE

Impact	Significance Determination	
	LCSD Site	Sampling Station Site
Impact LU-1: Temporary disruption or displacement of existing land uses during construction.	PSM	PSM
Impact LU-2: Permanent displacement or long-term disruption of existing land uses.	LS	LS
Impact C-LU: Cumulative disruption of established communities and changes in existing land use patterns.	LS	LS

B = Beneficial impact
N/A = Not Applicable or no impact
LS = Less than Significant impact, no mitigation required
SM = Significant impact, can be Mitigated to less than significant
PSM = Potentially Significant impact, can be Mitigated to less than significant
SU = Significant Unavoidable impact
PSU = Potentially Significant Unavoidable impact

5.2.3.4 Construction Impacts

Impact LU-1: Temporary disruption or displacement of existing land uses during construction.

Temporary disruption of existing land uses would occur if the project interfered with or disturbed existing land use activities or impeded access to land uses during construction. Displacement would occur if the project temporarily relocated or removed existing land uses to accommodate project construction. The analysis of temporary land use impacts considers several factors, including: the land use type; proximity to proposed construction and staging areas; availability of similar land use activities or resources (such as parking) in the project area; the duration of the disruption or displacement; and the combined severity of indirect impacts related to noise, air emissions, traffic congestion, traffic hazards, and/or impeded access.

Lower Crystal Springs Dam Vicinity

The proposed modifications to the LCSD include widening the spillway; reshaping and raising the dam crest; filling existing depressions along the top of the dam to improve drainage; replacing the existing stilling basin at the base of the dam with a new larger stilling basin to accommodate future flows from the wider spillway; and placing riprap in the San Mateo Creek channel immediately downstream of the stilling basin. Project-related construction activities at the LCSD site would last up to 14 months, but the majority of the work would be completed in 9 months, including up to 6 months of 24-hour construction. Construction activities would vary depending on the construction phase, but would generally involve the operation of heavy construction machinery and equipment as well as the movement of haul trucks and other construction vehicles through the project area. The LCSD vista point and parking lot, and a 1,300-foot section of Skyline Boulevard between Crystal Springs Road and Bunker Hill Drive would be temporarily closed throughout project construction activities.

Existing land uses in the LCSD vicinity include recreational uses along the Sawyer Camp Trail, the Crystal Springs 4-H Club Farm, and suburban residential uses located northeast and east of the LCSD construction and staging areas in the town of Hillsborough (e.g., on Berryessa Way) and in the unincorporated San Mateo Highlands neighborhood (e.g., on Laurel Hill Drive, Tarrytown Street, and West Point Place). The segment of Skyline Boulevard that would be temporarily closed primarily serves recreational traffic and local traffic associated with residential neighborhoods to the northeast and southeast of the LCSD. As described in Section 5.6, Transportation and Circulation, project implementation would result in construction-related increases in traffic congestion and delays due to detours and an increased potential for conflicts between construction vehicles (which have slower speeds and wider turning radii) and autos, bicyclists, and pedestrians using roadways, particularly in the vicinity of Crystal Springs Road and Skyline Boulevard. With the exception of access to the LCSD vista point (which would not be publicly accessible throughout construction activities), access to all other existing land uses and land use activities in the vicinity, including residences, recreational trails, and the Crystal Springs 4-H Club Farm, would be maintained. The physical impacts associated with the detours and increased traffic volumes are addressed in Section 5.6, Transportation and Circulation. Refer to Section 5.10, Recreation, Impact RE-1, for a discussion of potential impacts on existing recreational uses related to closure of the LCSD vista point and this section of Skyline Boulevard, which is a popular bicycle route.

Construction noise levels would vary depending on the construction phase and associated activities, the distance from the proposed construction and staging areas to noise-sensitive land uses, the equipment being used, and the presence or absence of barriers between the noise source and noise-sensitive land uses. Residences would periodically experience construction-related noise levels exceeding speech and sleep interference thresholds, indicating that construction noise could affect existing daytime activities such as watching television and outdoor gardening and quieter nighttime activities such as sleeping or reading a book. Additionally, recreational activities (walking, hiking, and jogging) on the Sawyer Camp Trail would be disturbed due to construction-related noise; refer to Section 5.10 Recreation, for additional discussion of impacts on recreationists. Refer to Section 5.7, Noise and Vibration, for a more detailed discussion of the physical impacts due to construction-related noise disturbance in the project area.

Construction activities would generate fugitive dust, the physical effects of which could indirectly affect nearby residential and recreational land use activities. Construction equipment and traffic near the LCSD site would also generate exhaust emissions in addition to noise and dust, which could affect nearby land uses. Refer to Section 5.8, Air Quality, for a more detailed discussion of construction emissions of fugitive dust and engine exhaust.

The combination of direct impacts related to construction-related detours and traffic congestion throughout the 14-month construction period, noise levels exceeding speech and sleep interference thresholds, and increases in dust and exhaust emissions could substantially disrupt nearby residential, recreational, and educational/club-type land uses. Implementation of Mitigation Measures M-TR-1 (Traffic Control Plan); M-NO-1 (Administrative and Source Controls); M-NO-4 (Blasting Noise Controls); M-TR-1 (Traffic Control Plan); M-AQ-1a (Dust Control Measures); M-AQ-1b (Exhaust Control Measures); and M-AQ-1c (Additional Exhaust Control Measures) would address the direct traffic, noise, and air quality impacts of construction activities at nearby land uses. However, even with implementation of these measures, the combined, residual effects of the traffic, noise, and air quality impacts would be considered a *potentially significant* impact due to the overall disruption to adjacent land uses during the construction period. This impact would be reduced to a less-than-significant level through implementation of Mitigation Measure M-LU-1a (Neighborhood Notice). This measure would require that the SFPUC provide advanced notification to owners of potentially affected land uses within the Peninsula watershed and within 1,500 feet of the project sites regarding the construction location, schedule, nature of activities, and detours, as well as provide suggestions for avoiding traffic delays and reducing the effects of construction-related noise and air emissions. Measure M-LU-1a also requires that the SFPUC develop procedures for receiving and responding to questions and complaints during construction.

Sampling Station #5 Vicinity

Sampling Station #5, located at the Pulgas Discharge Channel and just west of the Pulgas Water Temple, would be raised to accommodate the proposed changes in reservoir operations once the dam improvements are completed. Construction at the sampling station site would be completed in about four months during the dry season and would occur concurrently with construction activities in the LCSD vicinity. Construction at this site would occur during daytime, weekday shifts only. Construction activities associated with Sampling Station #5 would be conducted in an established, off-street work area that is not accessible by the public. As described above in Section 5.2.1, land uses in the immediate vicinity of Sampling Station #5 consist of the Pulgas Water Temple and other SFPUC water system facilities, surrounded by largely undeveloped watershed lands and open space. The Pulgas Water Temple would be the only land use potentially affected by LCSDI construction activities.

Construction activities at Sampling Station #5 site would not substantially increase traffic volumes or require temporary traffic lane or roadway closures. The detailed analysis of the project's effects on traffic and circulation is presented in Section 5.6, Transportation and Circulation. Construction activities at the Sampling Station #5 and staging area would result in increased noise levels that would periodically exceed the outdoor speech interference threshold and could disrupt the experience of visitors at the Pulgas Water Temple, particularly during special events such as weddings. Refer to Section 5.7, Noise and Vibration, for a more detailed discussion of impacts due to construction-related noise disturbance in this area. Construction activities would also generate fugitive dust and equipment emissions that could adversely affect the experience of visitors at the Pulgas Water Temple, particularly if special events were held during the four-month construction duration. Refer to Section 5.8, Air Quality, for a more detailed discussion of construction emissions of fugitive dust and engine exhaust. Although implementation of Mitigation Measures M-AQ-1a (Dust Control Measures); M-AQ-1b (Exhaust Control Measures); and M-AQ-1c (Additional Exhaust Control Measures) would reduce the impact of these construction-related effects at nearby land uses, the overall impact related to land use disturbance would remain *potentially significant*. However, implementation of Mitigation Measure M-LU-1a (Neighborhood Notice), which would require that the SFPUC post information regarding the construction activities and schedule at the Pulgas Water Temple, and Mitigation Measure M-LU-1b (Event Scheduling at the Pulgas Water Temple), which restricts special events at the Pulgas Water Temple during proposed construction, would avoid any potential disturbance of such events, reducing this impact to a less-than-significant level.

5.2.3.5 Operational Impacts

Impact LU-2: Permanent displacement or long-term disruption of existing land uses.

An impact on land uses would occur if the proposed project were to permanently displace or disrupt established land uses due to project siting or operations. The proposed project involves improvements to existing facilities at the LCSD and at Sampling Station #5 and would not introduce new uses or intensify existing uses at any of the project sites. Upon completion of the proposed project, the dam and sampling station would operate as they do under existing conditions. Upon completion of LCSDI construction activities, disturbed areas in the vicinity of the LCSD and Sampling Station #5 would be restored to their pre-project condition, and all temporary buildings and equipment would be removed. For these reasons, the proposed project would not result in any permanent displacement or long-term disruption of existing land uses. Therefore, operational impacts of the project on land use would be *less than significant*, and no mitigation is required.

5.2.3.6 Mitigation Measures

Mitigation Measure M-LU-1a: Neighborhood Notice.

The SFPUC or its contractor shall provide 14-day advance notice by mail to all facilities, tenants, and property owners within the Peninsula watershed and within 1,500 feet of project construction zones. The notice will also be posted near the project sites and at nearby recreational facilities. The notice shall state the construction location, nature of activities, and schedule. The notice shall indicate alternative traffic and bicycle routes and provide suggestions for avoiding traffic delays and reducing the effects of construction-related noise as well as dust and exhaust emissions (e.g., planning alternative schedules, closing windows facing the planned construction sites).

The SFPUC shall identify and provide a public liaison officer before and during construction to respond to the concerns of nearby residences, recreationists, and other potentially affected land uses. Procedures for contacting the public liaison officer via a toll-free telephone number, email, or in person shall be included in the notices. Prior to construction, the SFPUC communications manager, resident engineer, and construction manager shall develop procedures for receiving and responding to questions and complaints. This effort shall be coordinated with Mitigation Measures M-AE-2 (Site-Specific Construction Lighting Plan and Complaint Line) and M-NO-1 (Administrative and Source Controls), which also requires that the SFPUC develop procedures for receiving and responding to questions and complaints from the public.

Mitigation Measure M-LU-1b: Event Scheduling at the Pulgas Water Temple.

The SFPUC shall post signage at the Pulgas Water Temple in advance of construction to notify visitors of the nature, extent, and duration of construction activities. In addition, to ensure that weddings and other special events at the Pulgas Water Temple will not be adversely affected by construction activities, the SFPUC shall restrict special events at the Pulgas Water Temple during the construction period.

5.2.3.7 Cumulative Impacts

Impact C-LU: Cumulative disruption of established communities and changes in existing land use patterns.

The geographic scope of potential cumulative land use impacts encompasses land uses in the vicinity of the LCSD and Sampling Station #5 construction and staging sites. This area generally includes the SFPUC's Peninsula watershed lands and the nearby suburban residential areas.

The project would not involve any permanent land acquisition or easements, and therefore would not contribute to permanent land use displacement. The LCSDI project would be constructed entirely within existing SFPUC facility sites and within the Peninsula watershed, and would not result in any land use changes or disruptions to land use activities. For these reasons, the project's contribution to permanent cumulative impacts on land use would not be cumulatively considerable and would be *less than significant*.

Because the project would not alter land use, cumulative land use impacts would pertain to physical impacts that indirectly affect land use during construction (e.g., traffic, air quality, and noise). (Refer to Impact C-RE in Section 5.10, Recreation, for a discussion of cumulative impacts on recreation.) The project would contribute to cumulative land use impacts if the project's construction schedule were to coincide with the schedules of other projects in the vicinity, or if the duration of project construction were to be extended such that construction-related land use impacts occurred within the same geographic area.

Lower Crystal Springs Dam Vicinity

Five projects would be located adjacent to or near the LCSD project site and staging areas that could either coincide in time or extend the construction duration in the same area: San Mateo County's Crystal Springs Dam Bridge Replacement project, the SFPUC's Crystal Springs/ San Andreas (CSSA) Transmission Upgrade project, PG&E's Jefferson-Martin Transmission Line project, the SFPUC's Crystal Springs Pipeline No. 2 (CSPL2) Replacement project, and the SFPUC's WSIP Habitat Reserve Program (HRP).

As indicated in Section 5.1, Overview, Table 5.1-1 and Figure 5.1-2, construction at the LCSD site is scheduled to occur following demolition of the Skyline Boulevard Bridge and completion of the north tunnel shaft for the New Crystal Springs Bypass Tunnel (NCSBT) project. Construction of the proposed project would take place concurrently with construction of the south tunnel shaft for the NCSBT project as well as the CSSA Transmission Upgrade project for nine months, and with the CSPL2 Replacement project for a period of about six months. Additionally the project would overlap with the HRP, which includes various projects to enhance, preserve, and create new habitat at locations near Crystal Springs Reservoir.

To the extent that these construction schedules coincide, the project would contribute to cumulative disruption of residential land use activities in the vicinity of the Skyline Boulevard and Crystal Springs Road junction as a result of increased traffic congestion, noise levels, and dust and exhaust emissions from multiple projects in this area. In addition, the 14-month construction period of the proposed project combined with replacement of the Skyline Boulevard Bridge would close the bridge segment of Skyline Boulevard for a minimum period of 32 continuous months, which would include demolition of the bridge (6-month period) prior to construction of the LCSD, LCSDI project construction (14-month period), and reconstruction of the bridge following completion of the LCSD improvements (12-month period). The combination of these cumulative physical effects would result in prolonged disruption to residential uses east of the LCSD site in Hillsborough (i.e., Berryessa Way) and those in the Highland estates (i.e., Laurel Hill Drive, Tarrytown Street, and West Point Place).

Project-specific direct impacts related to traffic, noise, and air quality would be addressed with implementation of M-TR-1 (Traffic Control Plan), described in Section 5.6, Transportation, and Circulation; M-NO-1 (Administrative and Source Controls) and M-NO-4 (Blasting Noise Controls), described in Section 5.7, Noise and Vibration; and M-AQ-1a (Dust Control Measures), M-AQ-1b, (Exhaust Control Measures), and M-AQ-1c (Additional Exhaust Control Measures), described in Section 5.8, Air Quality. Implementation of Mitigation Measures M-LU-1a (Neighborhood Notice), described above, would reduce the project's overall impacts on land use to a less-than-significant level. With the combined implementation of these mitigation measures, the proposed project's contribution to cumulative land use impacts related to overlapping construction schedules or extended construction periods in these areas would not be significant, and the project's residual contribution to permanent cumulative impacts on land use would not be cumulatively considerable (*less than significant*).

Sampling Station #5 Vicinity

The proposed project could overlap with construction of three other SFPUC projects in the vicinity of Sampling Station #5. These projects include the Pulgas Discharge Channel Modifications, the Pulgas Structural Rehabilitation and Roof Replacement, and the Pulgas Modification of Existing Dechloramination Facility. Potential cumulative impacts would result from construction-related air quality and noise impacts in the vicinity of the Pulgas Water Temple. However, implementation of Mitigation Measures M-NO-1 (Administrative and Source Controls); M-AQ-1a (Dust Control Measures); M-AQ-1b (Exhaust Control Measures); and M-AQ-1c (Additional Exhaust Control Measures) would address these impacts. In addition, implementation of Mitigation Measure M-LU-1b (Event Scheduling at the Pulgas Water Temple) would ensure the project's contribution to land use disruption from construction-related air emissions and noise increases in the vicinity of Sampling Station #5 and the Pulgas Water Temple would not be cumulatively considerable (*less than significant*).

5.2.4 References

(None)

5.3 Aesthetics

This section addresses the potential aesthetic and visual quality impacts associated with implementation of the proposed Lower Crystal Springs Dam Improvements project (LCSDI project). Aesthetic resources, commonly referred to as visual resources, are defined as the visible natural and built landscape features that surround a project site. This analysis describes the existing visual setting, evaluates the LCSDI project's effects on visual resources, and specifically addresses the impacts of proposed actions on views from designated scenic roads, scenic areas, and/or public view corridors. Scenic vistas, roadways, and corridors are established for the purpose of protecting or preserving an aesthetic resource and are typically documented in general plans and resource management plans.

5.3.1 Setting

This section describes the existing visual setting of the LCSDI project area, which is located within the Peninsula watershed in San Mateo County, California. More specifically, this section summarizes scenic resources, including scenic routes, scenic vistas, and public view corridors located in the vicinity of the LCSDI project. The project area consists of three main sites: (1) Lower Crystal Springs Dam (LCSD), including the top of the dam and associated portions of Skyline Boulevard and the toe of the dam and areas surrounding the stilling basin along San Mateo Creek; (2) Sampling Station #5 on the Pulgas Discharge Channel; and (3) Crystal Springs Reservoir, including both Upper and Lower Crystal Springs Reservoirs. The first two sites are located in the eastern portion of the Peninsula watershed, in mostly undeveloped (excluding water system facilities) open space areas in or adjacent to open water and riparian and wetland areas.

5.3.1.1 Definitions

Visual character, visual quality, and visual sensitivity are three terms used throughout this section. *Visual character* is the unique combination of landscape features that combine to make a view, including native landforms, water, and vegetation patterns as well as built features such as buildings, roads, and other structures. Landscape and built features combine to form unique perspectives with varying degrees of visual quality. *Visual quality* is the intrinsic appeal of a landscape or scene due to the combination of natural and built features in the landscape, and this analysis rates visual quality as high, medium, or low. *Visual sensitivity* is the level of interest or concern that the public has for a particular aesthetic resource. Visual sensitivity is a measure of how noticeable proposed changes might be in a particular scene and is determined based on the overall clarity, distance, and relative dominance of the proposed changes in the view, as well as the duration that a particular view could be seen. Areas such as scenic vistas, public parks, public trails, or scenic roadways typically have high visual character and quality; in addition, viewer sensitivity is typically considered high due to the clarity offered by longer duration views in a natural setting.

5.3.1.2 Regional Setting

The proposed project improvements would be constructed on the eastern side of Crystal Springs Reservoir, which lies within the Peninsula watershed. The Peninsula watershed is owned by the City and County of San Francisco (CCSF) and managed by the SFPUC. It covers up to 23,000 acres on the San Francisco Peninsula, including lands on the eastern slope of the Peninsula between Skyline Boulevard (Highway 35) and Interstate 280 (I-280). The dominant features of the Peninsula watershed are Crystal Springs and San Andreas Reservoirs. The landscape of the watershed lands is primarily undeveloped land, open water, riparian and wetland vegetation, and a mix of grassland, chaparral, and woodland habitats. The western side of Crystal Springs Reservoir mainly consists of heavily forested ridges and slopes with a mix of woodland and grassland vegetation, whereas the eastern side of the reservoir is adjacent to predominantly residential land uses. Land uses surrounding the watershed are predominantly residential to the north and east and private undeveloped open space to the west.

In 1969, the CCSF granted two scenic easements to the U.S. Department of the Interior (DOI) as part of the construction of I-280; these easements (the Scenic Easement and Scenic and Recreation Easement) protect an approximately 19,000-acre area west of Crystal Springs and San Andreas Reservoirs and an approximately 4,000-acre area in the vicinity of I-280 (see Chapter 4, Plans and Policies, and Section 5.3.2, Regulatory Framework, below).

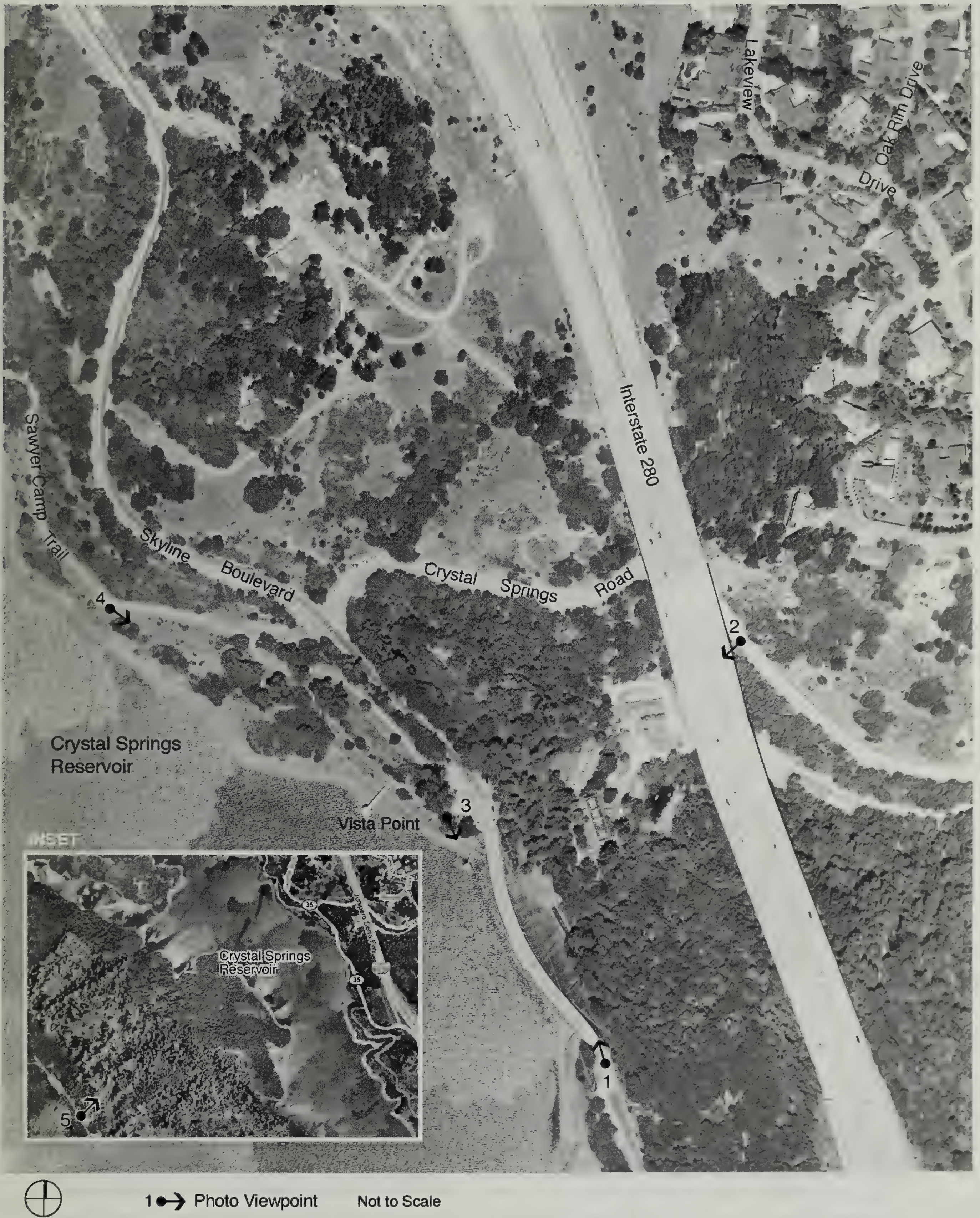
5.3.1.3 Local Setting

The LCSDI project area is located within a scenic resource area—the Peninsula watershed. A portion of the project would also be located within or adjacent to the DOI's scenic easements described above. The existing Skyline Boulevard Bridge, located on top of the LCSD, is part of a county-designated scenic route. As described in Chapter 3, Project Description, and Chapter 7, Other CEQA Issues, the SFPUC is coordinating the design and construction of the proposed LCSDI project with San Mateo County's Skyline Boulevard Bridge Replacement Project. Both the Skyline Boulevard Bridge and the LCSD are clearly visible features for numerous residents and recreationists in the project area (see Section 5.10, Recreation, for a description of recreationists in the project area). **Figure 5.3-1** is an aerial photograph of the project area that shows the locations where photographs were taken of the LCSD; these locations represent the viewpoints described and analyzed in this section (for further detail, see Section 5.3.3.2, Approach to Analysis, below).

Scenic Routes

Interstate 280 (Junipero Serra Freeway)

Interstate 280 (I-280) is a state-designated scenic highway that extends from the city of San Bruno to Santa Clara County. I-280 is located within 500 feet of the LCSD (about 100 feet above and 475 feet east of the dam) and runs parallel to Crystal Springs Reservoir along its entire length (about nine miles). Portions of the reservoir can be seen from I-280. However, the LCSD cannot be seen from a typical passenger vehicle on I-280 because of the proximity of the highway to the dam and the 3-foot-high safety railings on the edge of the road that block lateral or downward



SOURCE: Environmental Vision, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.3-1
Photo/Visual Viewpoint Locations

views. Views of the watershed are available from vista points along I-280; however, views are so distant (approximately two miles) that the dam cannot be seen. Since the LCSD is not visible from I-280 and the reservoir is distant, the visual sensitivity from this scenic highway is considered low.

Skyline Boulevard (Highway 35)

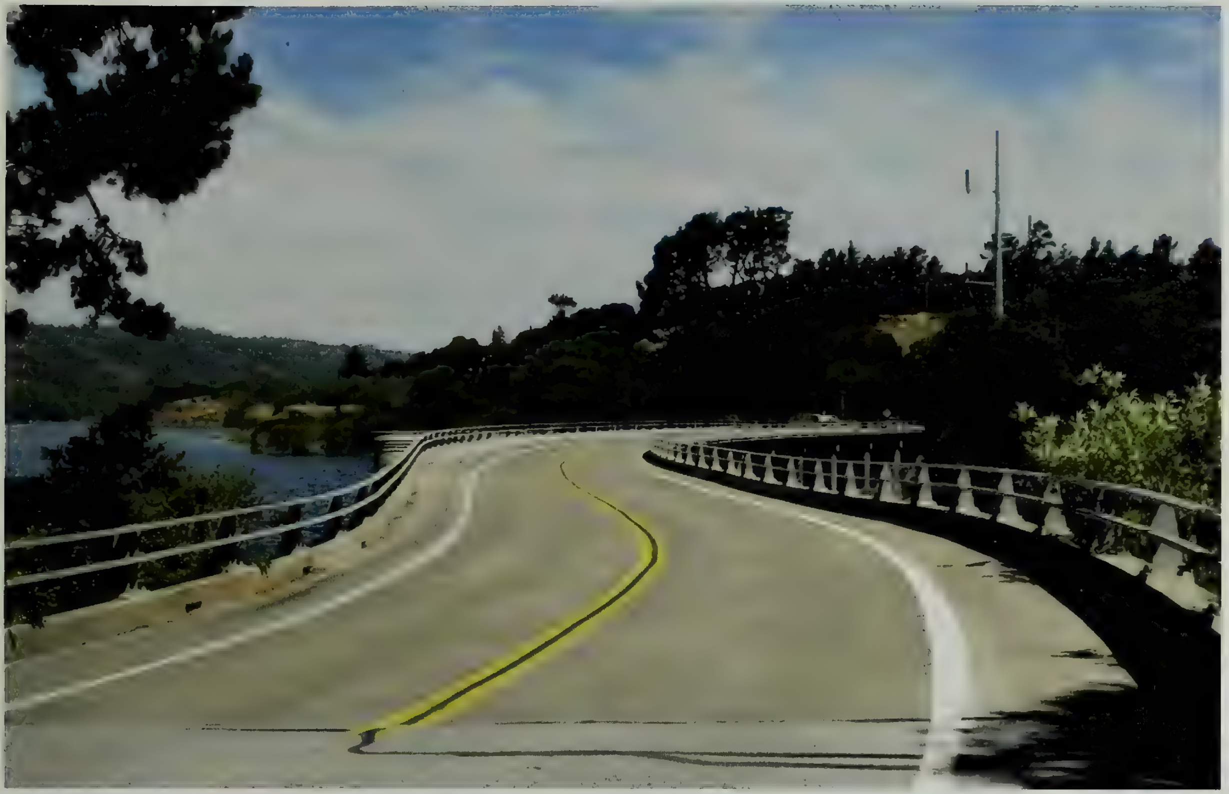
The portion of Skyline Boulevard that crosses the Skyline Boulevard Bridge and LCSD is a county-designated scenic road (San Mateo County, 1986). Across the bridge, views to the west include expansive views of the reservoir and forested slopes of the Peninsula watershed. Due to the unobstructed nature of the bridge, Skyline Boulevard offers striking and memorable views of the reservoir as the road crosses over the top of the LCSD. As shown in the top photo of **Figure 5.3-2**, from a motorists' perspective, views facing northwest from this segment of Skyline Boulevard are dominated by the reservoir to the west and mixed Monterey cypress and other hardwood trees that punctuate the horizon above the vista point to the north. For pedestrians and possibly bicyclists crossing the bridge in the northbound lane, the downstream face of the dam, spillway, and stilling basin are partially visible. However, due to the height of the bridge and acute angle, views of the dam are generally obscured for motorists traveling along this road. Motorists along this stretch of the road also have partial views of the LCSD outlet tower located near the vista point. Since Skyline Boulevard is a scenic road and because scenic views of the reservoir, shoreline vegetation, and watershed lands are available from this road, the visual quality of the area and visual sensitivity of the dam from this scenic route are considered high.

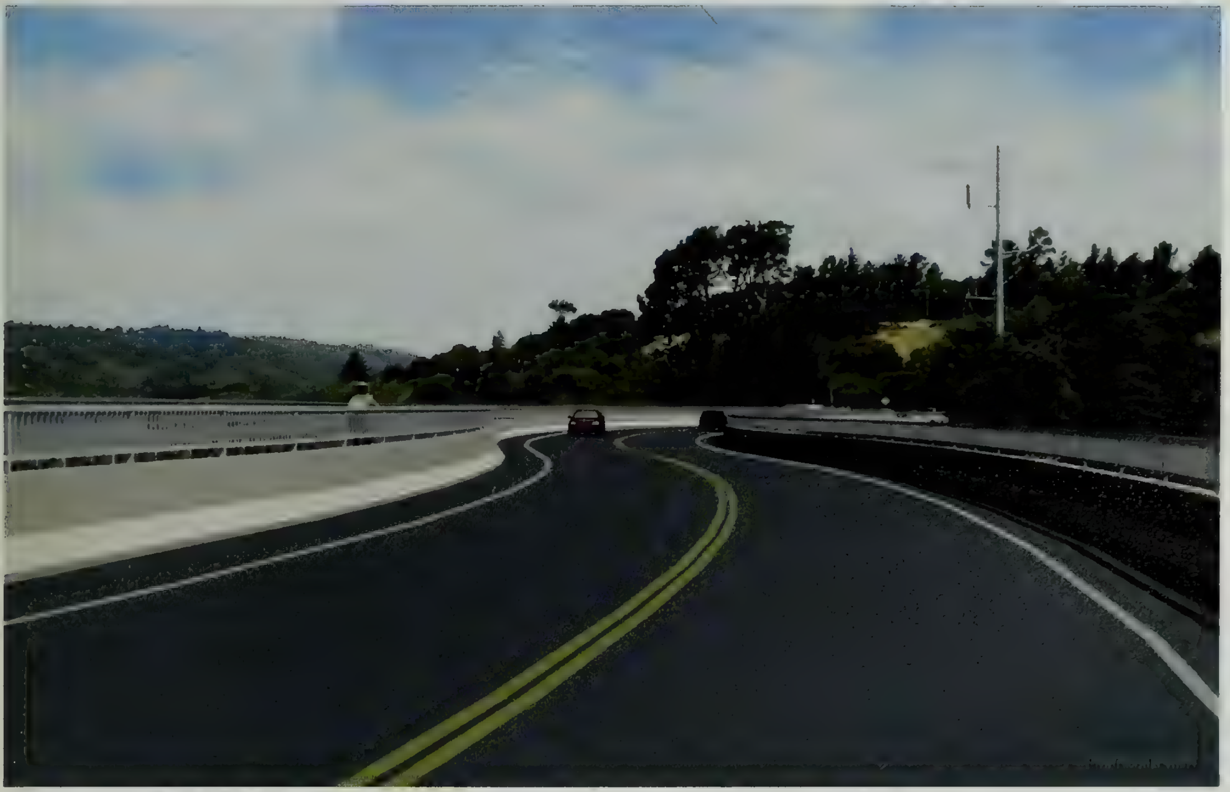
Half Moon Bay Road / Highway 92

Half Moon Bay Road / Highway 92 is identified as a San Mateo County scenic corridor (San Mateo County, 1986) and passes through the DOI Scenic Easement and Scenic and Recreation Easement described above. From west to east, views of the watershed lands begin at the summit of the Santa Cruz Mountains (Skyline Boulevard / Highway 92 intersection). As this highway winds down the eastern slopes, views of the reservoir become more immediate. Highway 92 passes between Upper and Lower Crystal Springs Reservoirs on a causeway, providing views of the eastern slopes of the grass-covered hillsides to the east and densely forested areas of Cahill Ridge. The LCSD, however, is not visible from this highway. Although the LCSD is not visible, immediate views of the reservoir and shoreline vegetation are briefly available from this highway. For this reason, the visual sensitivity from this perspective is considered medium.

Crystal Springs Road

Crystal Springs Road is a rural, two-lane, county-designated scenic route that connects Skyline Boulevard to the city of San Mateo to the east (San Mateo County, 1986). Direct views of the downstream face of the dam, crest, and spillway are visible from this road (approximately 900 feet to the northeast), as shown in **Figure 5.3-3** (top photo). From this location on Crystal Springs Road (which is directly beneath I-280), bicyclists and motorists can also see the top portion of the Crystal Springs Pump Station. A mix of forest and woodland trees screens the lower portion of the spillway. Views of the dam for motorists traveling on this road are brief due to the windiness of the road. However, because Crystal Springs Road is a county scenic route and

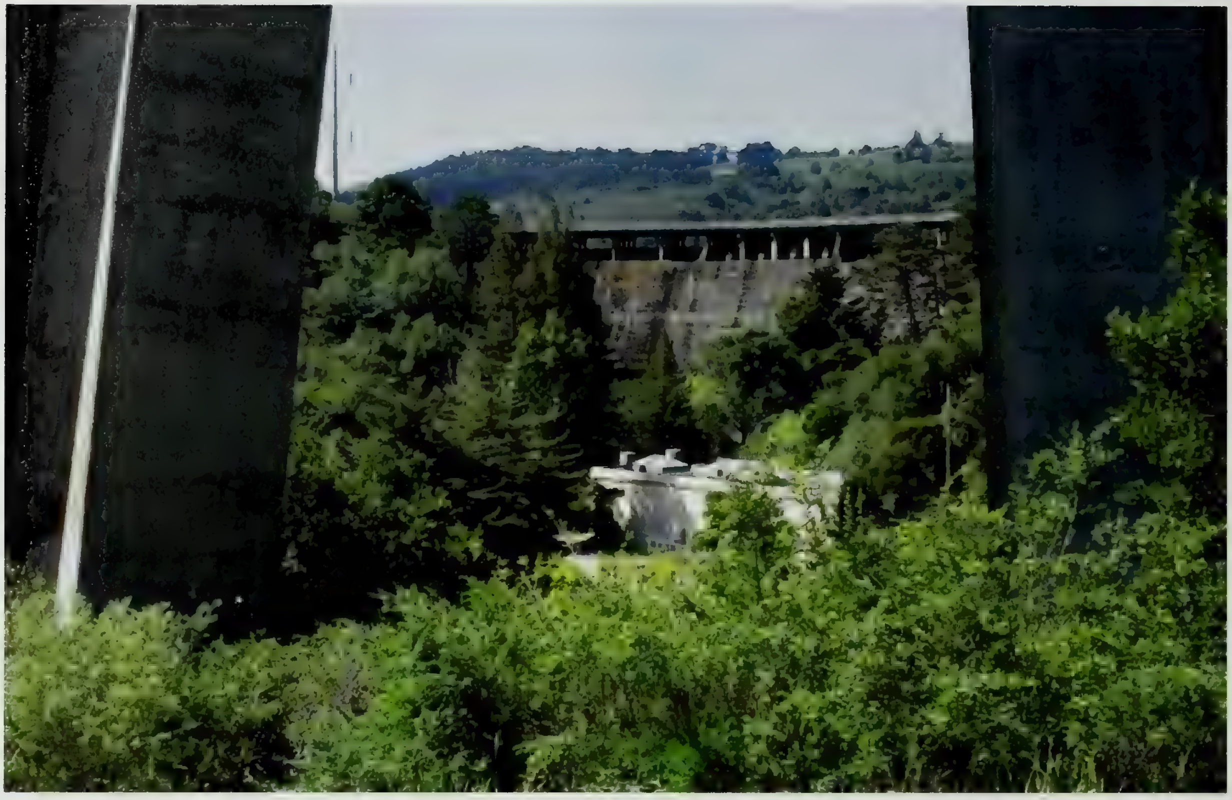

Skyline Boulevard looking north (Photo Viewpoint 1)


Visual Simulation of Proposed Project

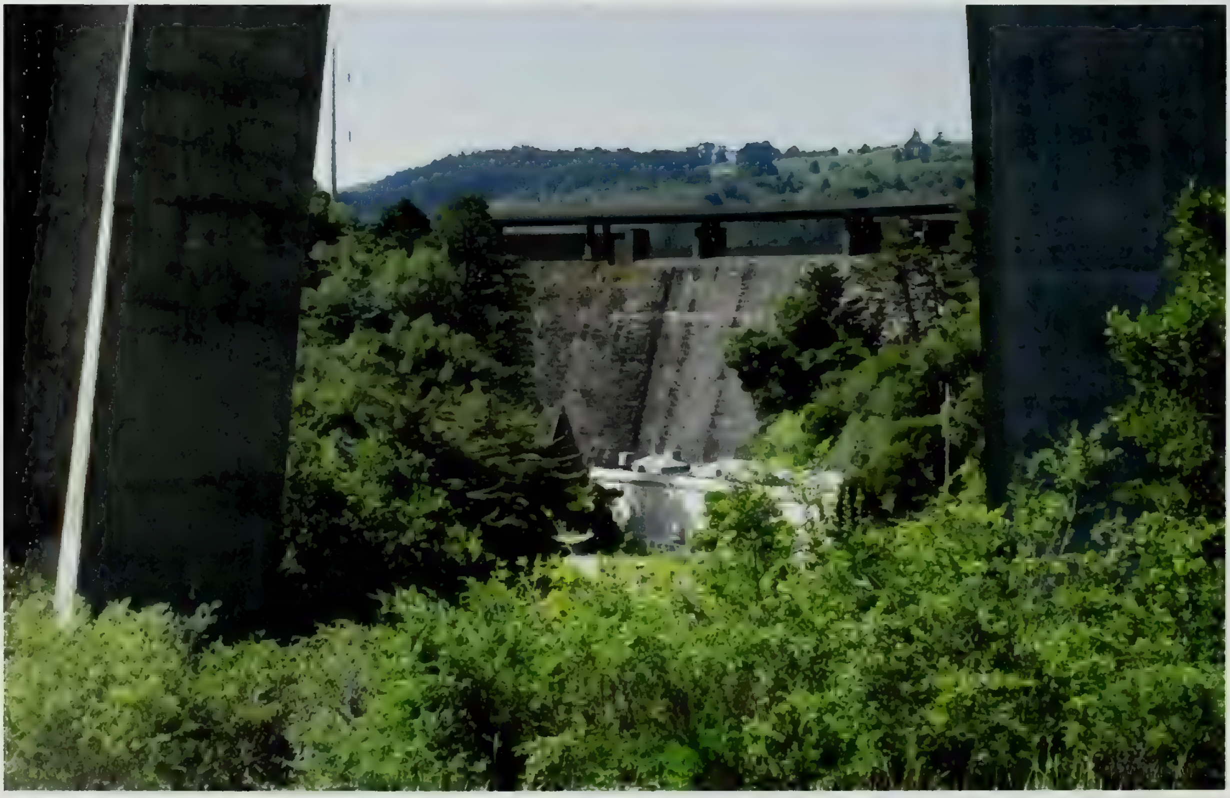
SOURCE: Environmental Vision, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.3-2
Skyline Boulevard- Existing View
and Visual Simulation



Crystal Springs Road looking southwest (Photo Viewpoint 2)



Visual Simulation of Proposed Project

SOURCE: Environmental Vision, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.3-3
Crystal Springs Road- Existing View
and Visual Simulation

because direct views of the dam and spillway can be seen from this road, the visual quality and visual sensitivity are both considered high.

Cañada Road

Cañada Road, which intersects Highway 92 approximately 1.85 miles south of the LCSD, is a county-designated scenic route (San Mateo County, 1986). The roadway parallels the Upper Crystal Springs Reservoir shoreline for a distance of approximately two miles and continues south through the Peninsula watershed. Cañada Road is a popular recreational bicycle route and offers a quiet bypass to I-280. From this road, motorists and bicyclists have extensive views of the reservoir, the forested Santa Cruz Mountains to the west, the grass-covered hills to the east, and the Pulgas Water Temple. The Pulgas Discharge Channel and the water quality sampling station are situated behind the Pulgas Water Temple. From Cañada Road, trees and vegetation screen views of these structures; however, long-lasting views of the reservoir and shoreline vegetation are available along Cañada Road. Thus, the overall visual sensitivity is considered medium.

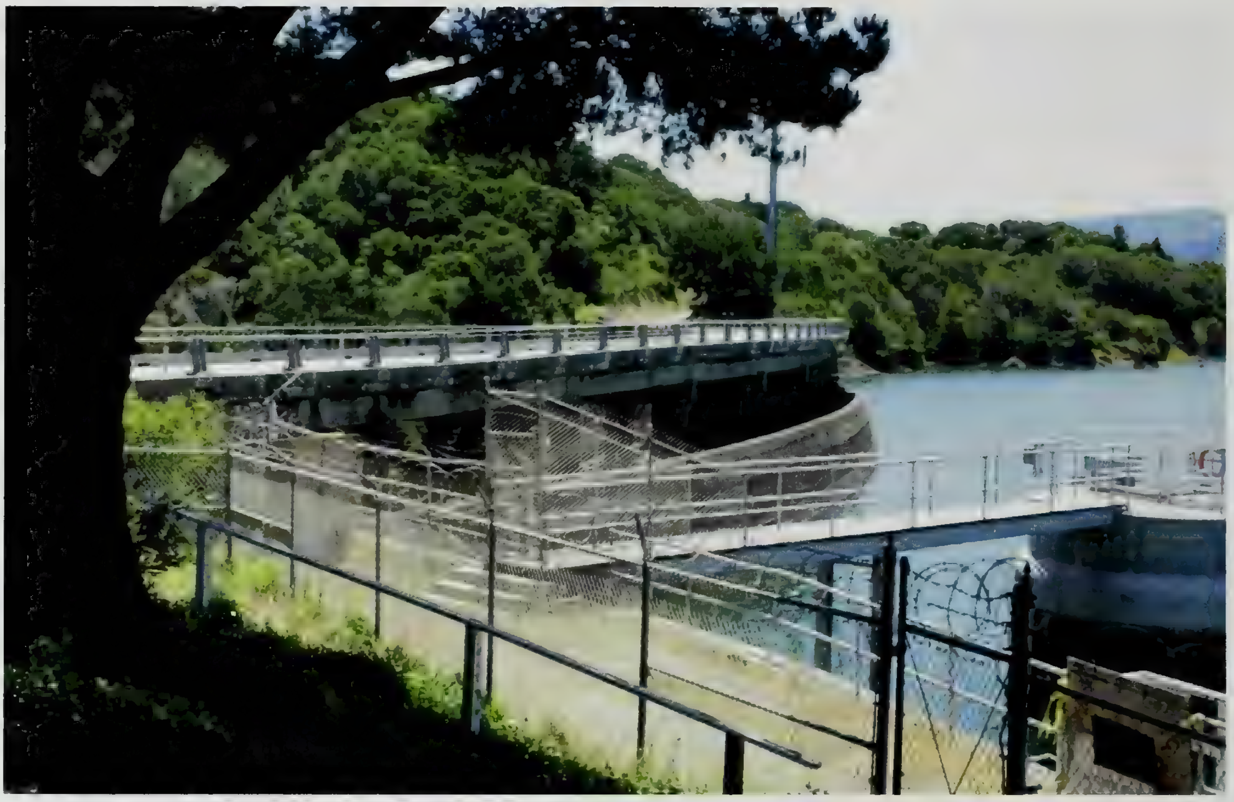
Vista Point

The vista point situated just north of the Skyline Boulevard Bridge and LCSD contains a small parking area, informational signage, and benches. This parking area also serves the Sawyer Camp Trail, located just to the north of the vista point. At the vista point, shoreline vegetation partially shrouds views of Crystal Springs Reservoir and the distant watershed lands. This vegetation helps to block wind but also obstructs views to the water and watershed; this, coupled with the presence of security fencing topped with razor wire in the foreground, compromise the scenic quality of this vista point. Facing south, viewers can see the upstream face of the dam from this vista point, as shown in **Figure 5.3-4**, top photo. From this viewpoint, the fencing and the outlet tower are prominent in the foreground in front of the dam, which defines the water's edge. The bridge is above the dam and, from this perspective, is below the skyline and level with the viewer so that only the side of the bridge is visible. Because of the obstructions in the foreground, the visual quality of the area is considered medium. However, this vista point is a popular recreational site, and expectations of a quality view from a vista point are high; the vista point also provides long-duration views. Therefore, the visual sensitivity of the dam and reservoir from this site is considered high.

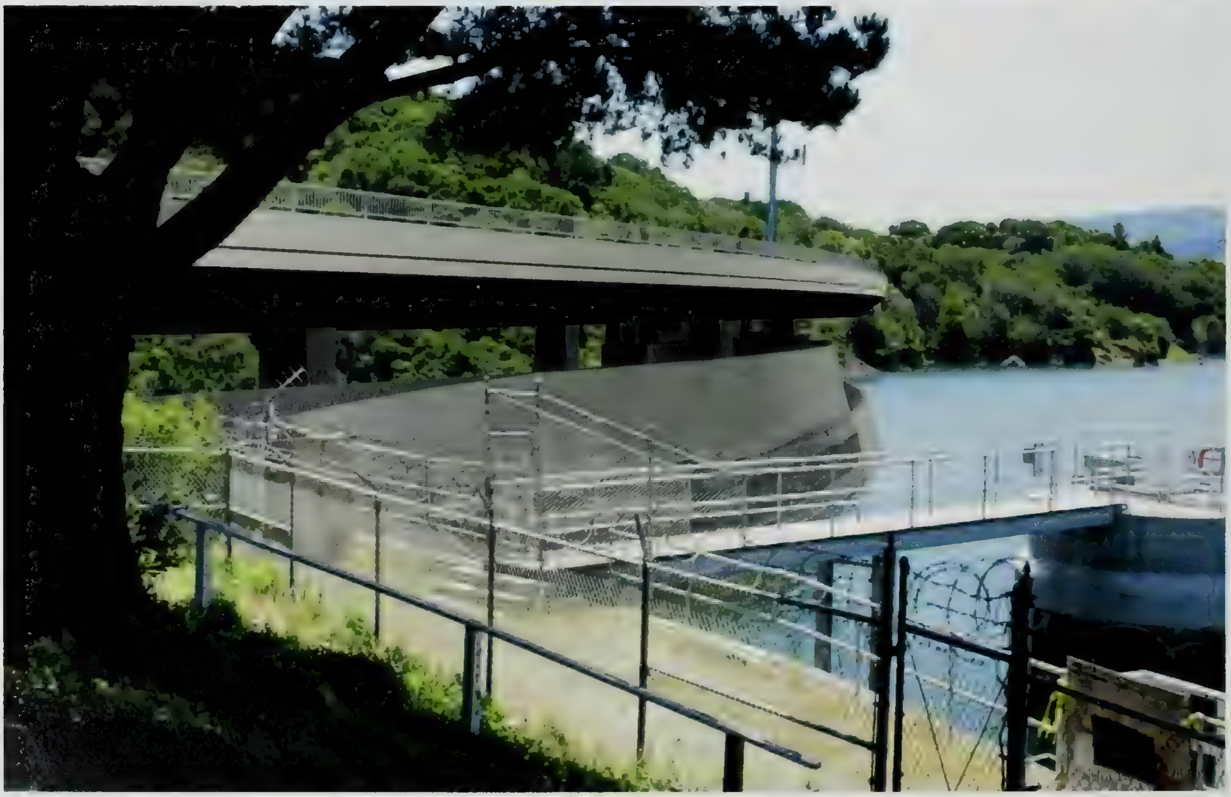
Recreational Trails

Sawyer Camp Trail

The Sawyer Camp Trail, a popular recreational trail for pedestrians and bicyclists, is located along the eastern side of the Peninsula watershed between San Andreas Reservoir and the LCSD. A variety of vegetation communities can be seen from the trail, including grassland, oak woodland, and dense riparian vegetation. Immediate views of Lower Crystal Springs Reservoir and shoreline vegetation are available from several locations along the trail. At some locations, the trail is heavily screened and shaded, and the reservoir water surface is not visible. In both cases, however, views from the trail are of high scenic quality. From the Sawyer Camp Trail, the



Vista point at Lower Crystal Springs Dam looking south (Photo Viewpoint 3)



Visual Simulation of Proposed Project

SOURCE: Environmental Vision, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.3-4
Vista Point- Existing View
and Visual Simulation

LCSD is visible from a distance of approximately 0.25 mile to the northwest (see **Figure 5.3-5**, top photo). Views of the dam are distant and subordinate to the overall natural setting of the reservoir within the larger watershed. However, because of the large number of recreational visitors using the trail that expect a high-quality experience in nature, the visual sensitivity of the dam and reservoir is considered high.

Fifield-Cahill Ridge Trail

The Fifield-Cahill Ridge Trail is a CCSF-owned recreational trail open on a reservation-only basis. It traverses the western side of the Peninsula watershed and stretches from Highway 92 to the Sweeney Ridge Trail (near San Andreas Reservoir). Upper and Lower Crystal Springs Reservoirs can be viewed from multiple locations along the Fifield-Cahill Ridge Trail. **Figure 5.3-6** shows the LCSD as seen from the trail at a distance of approximately one mile. Although views of the dam are very distant and are dominated by the I-280 bridge above it, high-quality views of the reservoir and watershed lands are available from this trail. Thus, the overall visual sensitivity of the dam and reservoir from this perspective is considered medium.

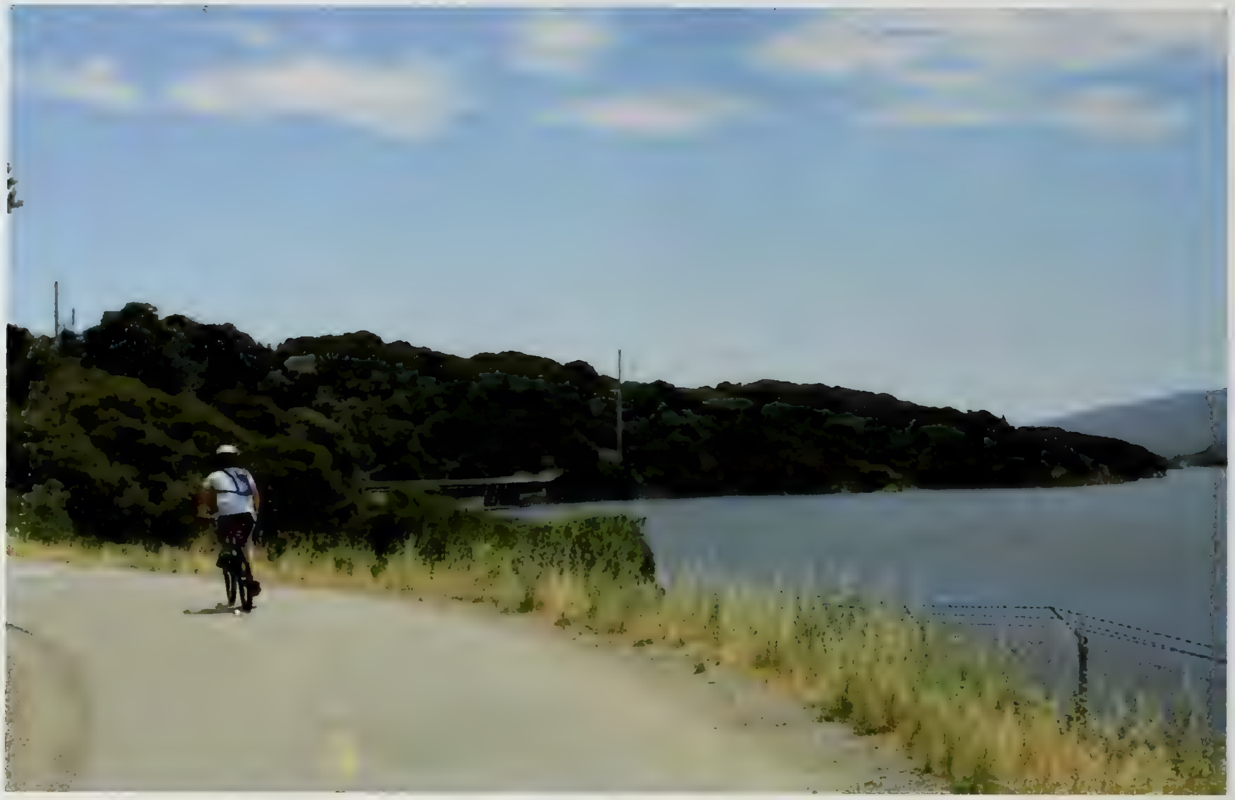
Other Views

Pulgas Water Temple

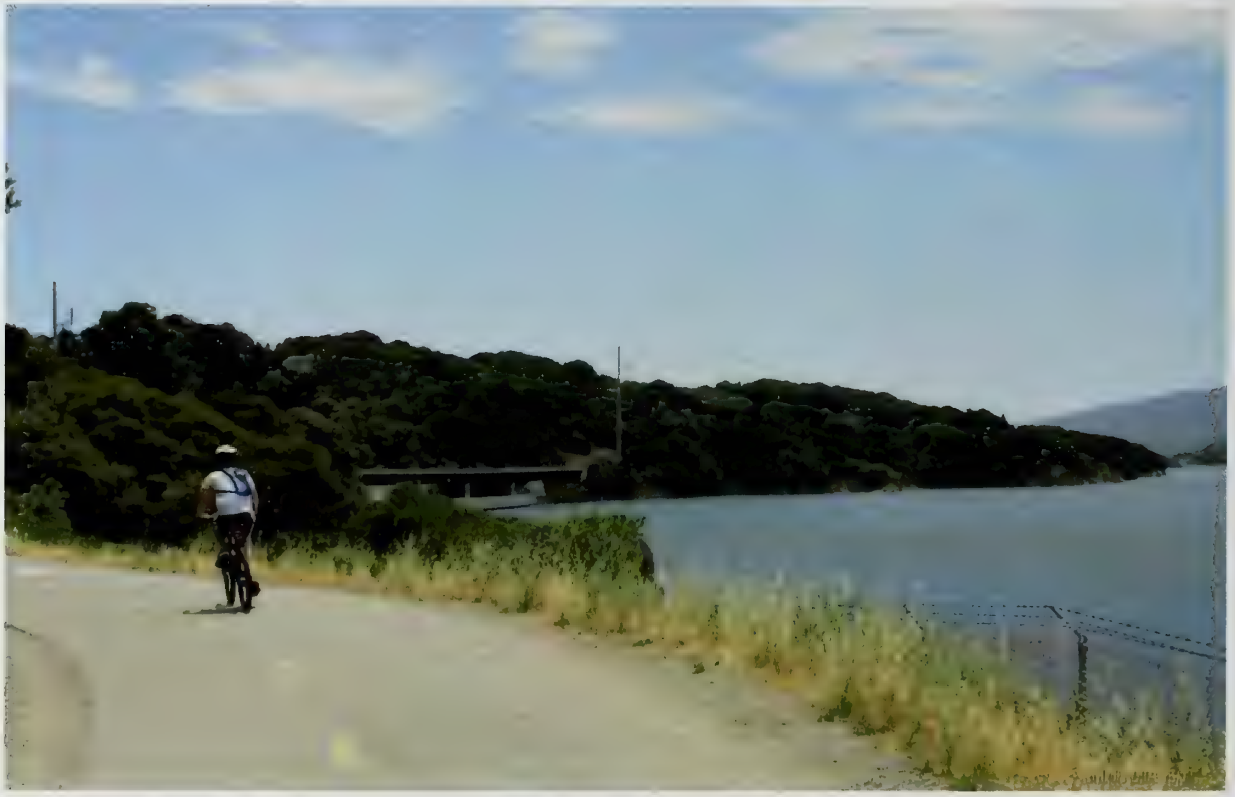
The Pulgas Water Temple is located on the south end of Upper Crystal Springs Reservoir, west of Cañada Road. A special-use area open to the public, it consists of a Roman Renaissance–style structure and reflection pool surrounded by manicured lawns, landscaping, and a parking lot. Views to the west consist of heavily forested watershed lands and to the east consist of undeveloped grassland. Because this is a special-use public area and the landscaping is well maintained, the visual quality is considered high. Sampling Station #5 and the Pulgas Discharge Channel, situated behind the temple, are barely visible from the temple due to the presence of trees and low-lying vegetation that screen these structures. For this reason, the visual sensitivity of Sampling Station #5 is considered low.

Lakeview Drive

Lakeview Drive is a residential street located approximately 0.35 mile northeast of the LCSD. Expansive views of the forested, east-facing slopes and glimpses of the reservoir are available from Lakeview Drive near Oak Rim Drive. In the middle ground, the I-280 bridge passes in front of the reservoir. Although the downstream face of the LCSD can also be seen from Lakeview Drive, views of the dam are dwarfed by the I-280 bridge, which is a much larger and continuous structure. Thus, scenic views of the Peninsula watershed can be seen from Lakeview Drive, and the visual quality is considered high. Nonetheless, the visual sensitivity of the dam and the reservoir from this perspective is considered medium due to the constrained views of the water below the I-280 bridge and the small number of public viewers at this location.



Sawyer Camp Trail looking southeast (Photo Viewpoint 4)

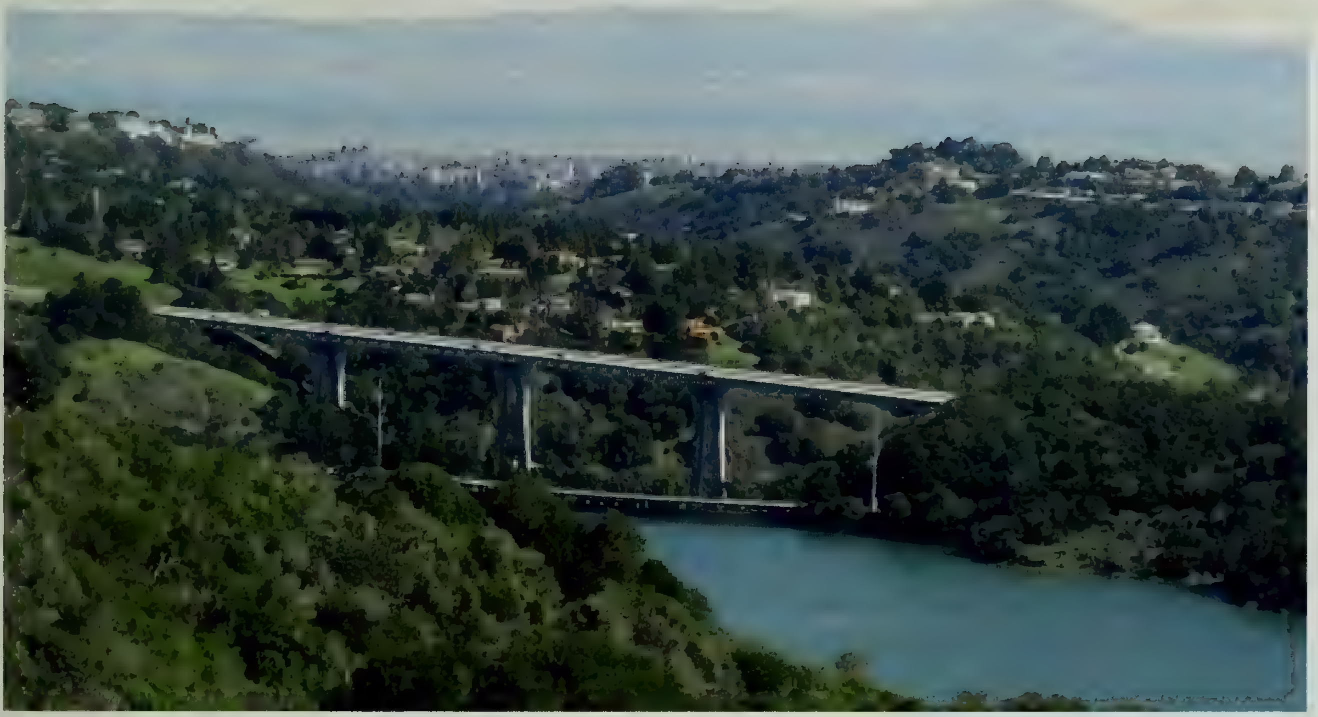


Visual Simulation of Proposed Project

SOURCE: Environmental Vision, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.3-5
Sawyer Camp Trail- Existing View
and Visual Simulation



View from Fifield-Cahill Trail (Photo Viewpoint 5)

SOURCE: Environmental Vision, 2009

Figure 5.3-6
Existing View from Fifield-Cahill Trail
(Photo Viewpoint 5)

5.3.1.4 Summary of the Visual Sensitivity of the Project Area

Table 5.3-1 summarizes the visibility and visual sensitivity of the LCSDI project sites from various viewpoints in the project area, including scenic routes, recreational trails, vista points, a residential area, and the Pulgas Water Temple.

TABLE 5.3-1
VISIBILITY AND VISUAL SENSITIVITY OF LCSDI PROJECT SITES

Project Site	Viewpoint Location	Visibility of Project Site from Scenic Resources / Other Public Viewpoints	Visual Sensitivity
LCSD and Reservoir	I-280, a state-designated scenic highway	Portions of the reservoir are visible from the highway; the LCSD is not visible.	Low
LCSD and Reservoir	Half Moon Bay Road/ Highway 92, a county-designated scenic corridor	The reservoir is highly visible; the LCSD is not visible.	Medium
LCSD and Reservoir	Skyline Boulevard (Highway 35), a county-designated scenic road	The reservoir is highly visible. The LCSD is also highly visible, since the bridge crosses directly over the LCSD; partial views of the downstream face of the dam, spillway, and stilling basin are available for pedestrians and possibly bicyclists.	High
LCSD	Crystal Springs Road, a county-designated scenic route	Direct views of the downstream face of the LCSD and spillway are available from approximately 900 feet northeast of the dam.	High
LCSD and Reservoir	Lakeview Drive, a residential street	Distant views of the reservoir and the crest and spillway of the dam are available from the residential area about 0.35 mile northeast of the dam; the view is dominated by the I-280 bridge, and there are very few public viewers.	Medium
LCSD and reservoir	Vista point, a public viewing point	The reservoir and LCSD are very visible from the vista point, about 100 feet north of the dam.	High
LCSD and Reservoir	Sawyer Camp Trail, a popular public recreational trail	The reservoir is highly visible. Views of the LCSD from the trail about 0.25 mile to the northwest are subordinate to the reservoir and broader watershed; a large number of recreational visitors use the trail.	High
LCSD and Reservoir	Fifield-Cahill Trail, a reservation-only recreational trail	The reservoir is visible. Distant views of the LCSD are available from this trail; the view from about one mile to the west is dominated by the I-280 bridge.	Medium
Sampling Station #5	Pulgas Water Temple, a special-use area open to the public	Views of the discharge channel and water quality sampling station are screened by vegetation. Visibility is low.	Low
Sampling Station #5 and Reservoir	Cañada Road, a county-designated scenic route	Intermittent views of the reservoir are available from Cañada Road. Views of the discharge channel and water quality sampling station are screened by vegetation. Visibility is low.	Medium

5.3.2 Regulatory Framework

5.3.2.1 Federal Regulations

U.S. Department of the Interior, Scenic Easement and Scenic and Recreation Easement

In 1969, the CCSF granted two easements over the vast majority of the Peninsula watershed to the Department of the Interior (DOI), which under 1980 legislation (16 U.S.C. §560bb) are administered by the Golden Gate National Recreation Area (GGNRA). The easements were granted to obtain a change in the alignment of I-280 to a less environmentally damaging location farther east of Crystal Springs Reservoir, and to increase the federal share of project costs. The easements cover nearly all of the CCSF-owned Peninsula watershed lands and place restrictive covenants on the use of lands that are primarily unrelated to the SFPUC's overall management of the watershed for utility purposes. The approximately 19,000-acre Scenic Easement covers the lands west of Crystal Springs and San Andreas Reservoirs. The Scenic and Recreation Easement includes approximately 4,000 acres of land in the vicinity of I-280 and provides for limited public access. The two easements contain very similar terms with the exception that outdoor recreation is expressly included as a permitted use in the Scenic and Recreation Easement. Both easements call for the preservation of the land in its present natural state, subject to SFPUC utility operations, and require that the land be used "for the collection, storage and transmission of water and protection of water quality; outdoor recreation [Scenic and Recreation Easement only]; ecological preservation and other purposes, which shall be compatible with preserving said land as open-space land for public use and enjoyment." The easement expressly reserves to the CCSF the perpetual right to use the property for "…purposes which they may find necessary or desirable for water or other utility operations as now or hereafter conducted, including without limiting the generality of the foregoing the right to construct, maintain, repair, expand and reconstruct building… storage facilities, reservoirs, pipe systems, cable systems, flumes, head walls, retention walls, bulkheads, cofferdams, pumphouses, dikes, roadways, public utilities and similar improvements" (CCSF, 1969).

Upper and Lower Crystal Springs Reservoirs and Sampling Station #5 lie within the Scenic Easement. The LCSD and staging areas along Skyline Boulevard are located along the eastern border of the Scenic Easement. The stilling basin and staging and storage areas at the toe of the dam are not within either easement, but these areas are bordered by the Scenic and Recreation Easement on the north and south and by the Scenic Easement on the west. All trees along the shoreline of Crystal Springs Reservoir lie within the Scenic Easement Area. The Scenic Easement contains language that restricts certain activities when not related to ongoing utility operations (e.g., placement of signs, encroachments by others, substantial excavation or topographical changes, and the cutting, destroying or removal of timber or brush) without the concurrence of the Department of the Interior.

The proposed project would involve dam modifications and would allow for increased water storage within Crystal Springs Reservoir. Construction of water utility improvements is within the reserved rights of the SFPUC under the terms of both easements. For this reason, the GGNRA has no discretionary approval authority over project activities but, as the owner of an easement interest in the property, GGNRA may participate in the environmental review process and Endangered Species Act section 7 consultations required by project permits as an interested party.

5.3.2.2 State Regulations

In 1963, the state legislature established the California Scenic Highway Program, a provision of the Streets and Highways Code, to preserve and enhance the natural beauty of California (Caltrans, 1996). The State Highway System includes highways that are either eligible for designation as scenic highways or have been designated as such.

In the Peninsula watershed area, I-280 (or the Junipero Serra Freeway) in San Mateo County is a designated state scenic highway. The Junipero Serra Freeway has been called the "world's most beautiful freeway" (Caltrans, 2007). Although the Peninsula watershed is approximately 0.75 mile west of I-280, distant views of the watershed can be seen from the freeway corridor. In addition, a portion of Highway 92 (west of the Highway 92 and I-280 interchange) is an eligible state scenic highway.

5.3.2.3 Local Regulations

The SFPUC has authority over the management, use, and control of its watershed lands under the San Francisco City Charter and seeks to manage its lands in a way that is consistent with San Francisco's overall planning policies. Through cooperative efforts with local jurisdictions, the SFPUC also works to avoid conflicts with local planning regulations. The *Peninsula Watershed Management Plan* (SFPUC, 2002) sets forth the SFPUC's policies for the watershed and covers a variety of issues, including aesthetics. An overview of relevant policies and protocols discussed in this plan, as well as those contained in the San Mateo County General Plan and in San Mateo County's Sudden Oak Death Program, is provided below.

Peninsula Watershed Management Plan

The *Peninsula Watershed Management Plan* guides development on land in the Peninsula watershed. The primary land management goal for the watershed, according to the management plan, is "to provide the best environment for the production, collection and storage of the highest quality water for the City and County of San Francisco and suburban customers in portions of San Mateo, Santa Clara, and Alameda Counties." Policies applicable to visual quality in the project area include the following:

- Policy WA22B: Proposals for new facilities, structures, roads, trails, projects, and leases or improvements to existing facilities shall be designed, sited, constructed, and maintained to blend with the natural landscape and conform with the goals and policies set forth in the Watershed Management Plan.

- Policy WA22H: Design and site facilities, structures, roads, and trails to minimize, wherever possible, grading and the visibility of cut banks and fill slopes.

- *Policy WA24*: Require that all proposed development involving any grading of land include the submittal of a grading plan to the SFPUC to retain the existing topography where feasible, minimize grading, minimize impacts on scenic, ecological, and cultural resources, and minimize offset soil loss from erosion.
- *Policy WA27*: Enforce strict design and siting standards for all signage on the watershed.
- *Action des5 (Phase A, Letter A)*: Where grading is necessary, slopes and landforms shall be contoured to mimic the surrounding environment as much as possible.
- *Action des5 (Phase A, Letter D)*: Incorporate architectural siting/design elements that are compatible with the applicable surroundings (i.e., style, scale, form, texture, color).
- *Action des5 (Phase A, Letter F)*: Exterior lighting shall be directed downward and sited and shielded such that it is not highly visible or obtrusive.
- *Action des5 (Phase A, Letter G)*: The silhouette of new structures shall remain below the skyline of bluffs, cliffs, or ridges.

San Mateo County General Plan

The San Mateo County General Plan defines a scenic road and corridor as a designated travel route and the adjacent land as seen from the road, which "provides outstanding views of natural landscapes and attractive man-made development" (San Mateo County, 1986). County-designated scenic routes directly adjacent to or in the Peninsula watershed include Skyline Boulevard (from Half Moon Bay Road to San Francisco), Half Moon Bay Road (Highway 92), Crystal Springs Road, and Cañada Road (from Skyline Boulevard to Easton Drive).

The San Mateo County General Plan policies encourage the protection and enhancement of the natural visual quality of San Mateo County and the visual quality of scenic corridors. The plan also includes policies related to minimizing exterior lighting in scenic corridors and screening areas used for the storage of equipment, supplies, or debris by using fencing, landscaping, or other means so that these construction-related materials are not visible from scenic roadways, trails, parks, and neighborhoods.

San Mateo County – Sudden Oak Death Program

Within the past decade, native coast live oaks in San Mateo County—including many in the CCSF-owned Peninsula watershed—have been dying in unprecedented numbers as a result of the pathogen *Phytophthora ramorum*, which is more commonly known as Sudden Oak Death (SOD) (see Section 5.13, Biological Resources, under Section 5.13.3.5, for more discussion on SOD). Since 2002, San Mateo County has been listed as a designated quarantined area due to the prevalence of SOD in the Peninsula watershed (Federal Register, 2007). To prevent the spread of this disease to uninfected areas, San Mateo County's agricultural commissioner regulates the movement of wood and plant materials consistent with state and federal regulations.

5.3.3 Impacts and Mitigation Measures

5.3.3.1 Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to aesthetics, but generally considers that implementation of the LCSDI project would have a significant impact on visual quality if it were to:

- Have a substantial adverse effect on a scenic vista;
- Substantially damage scenic resources, including but not limited to trees, rock outcroppings, and other features of the built or natural environment that contribute to a scenic public setting;
- Substantially degrade the existing visual character or quality of the site and its surroundings; or
- Create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area or that would substantially affect other people or properties.

5.3.3.2 Approach to Analysis

This analysis evaluates the potential impacts on visual and aesthetic resources, including impacts that could occur during both construction and operations. For the purpose of this assessment, visual resources are generally defined as the natural and built landscape features that can be seen. The overall visual character of a given area results from the unique combination of natural landscape features, including landform, water, and vegetation patterns, as well as built features such as buildings, roads, and other structures.

As described in Section 5.3.1, Setting, the Sampling Station #5 site is barely visible from the Pulgas Water Temple and Cañada Road because trees and landscaping screen the site from public view. Since this project site is not publicly accessible and views of the construction area cannot be seen from any publicly accessible locations, both construction and operational impacts on scenic resources and the visual character surrounding the site due to proposed activities at Sampling Station #5 are *not applicable.* Views of the Boat Ramp area and Staging Area 9 are accessible from Skyline Boulevard. However, since disruption at this site would be limited to the short duration when launching the barges and removing them from the reservoir; visual impacts at this site would be *not applicable.* Therefore, the impact analysis does not include any further discussion of the Sampling Station #5 or Boat Ramp area/Staging Area 9 components of the proposed project.

As described in Chapter 3, Project Description, the SFPUC proposes to coordinate the project's construction schedule and design elements with San Mateo County to accommodate San Mateo County's Crystal Springs Dam Bridge Replacement Project. The visual effects of the proposed project and San Mateo County's project are closely related with regard to both construction and operational impacts because they both share the same location. Construction of the proposed dam improvements is proposed to begin after San Mateo County has finished the demolition phase of its bridge replacement project. Thus, the project-specific impacts associated with construction of the dam improvements would only occur *after* San Mateo County removes the existing bridge. San Mateo County plans to construct the replacement bridge immediately after the SFPUC completes the dam improvements so as to minimize the length of time that Skyline Boulevard is closed. Consequently, the LCSD construction improvements would be visible to the public for only a short period of time before construction of the new bridge commences, and there would be very little visibility of the dam during this interim time because this portion of Skyline Boulevard and the vista point would still be closed to the public.

The analysis of long-term visual impacts considers the LCSDI and San Mateo County projects together since both projects would contribute to the permanent aesthetic effects of the proposed improvements. Therefore, this analysis considers the permanent visual impacts of the dam improvements relative to San Mateo County's project as part of the proposed project's direct impacts as well as cumulative impacts. The cumulative analysis, however, evaluates the project's overall effect on visual resources when considered together with the visual impacts of a much broader range of other planned or proposed projects in the LCSDI project area in addition to San Mateo County's bridge replacement project.

In addition to the long-term visual impacts related to the design and visual features of the proposed dam improvements, the analysis also evaluates the operational effects related to the proposed changes in water levels in Crystal Springs Reservoir that would occur following the completion of dam improvements. This portion of the analysis considers the visual effects of inundating vegetation along the shoreline of the reservoir under the proposed operations. The visual effects of proposed reservoir operations were evaluated based on the quantitative results of the biological resources analysis of long-term effects on vegetation, as described in Section 5.13, Biological Resources.

This visual assessment is based on field observations of the project surroundings, a review of project development plans and drawings, a review of related projects in the area, evaluations of aerial and ground-level photographs of the project area, and public planning documents. Site surveys were conducted in May and September 2009. The objectives of the site surveys were to observe the project site and surrounding area, to take representative photographs of existing visual conditions, and to consider the potential effects of the project from designated scenic resources and public viewpoints in the area.

The analysis of construction and operational impacts rely on the key observation points, photographs, and visual simulations described below.

Key Observation Points

Key observation points represent the broader set of views of the project and are typically selected from the closest publicly accessible locations. Multiple locations are often chosen to consider different views of the project and the changing context from which the project can be seen. Public views where visual sensitivity is high are the primary consideration. Photographs of the LCSD site were taken from several viewpoints where project activities would be visible, and simulations of proposed future conditions were produced from these photographs. Selected photographs were taken from designated scenic areas, roads, and vista points surrounding the LCSD site.

Table 5.3-2 shows the key observation points to the LCSD and specifies the location and direction of each key observation point. Figures 5.3-2 through 5.3-5 provide "before" and "after" images of the LCSD from these points.

TABLE 5.3-2
KEY OBSERVATION POINT LOCATIONS

Photo Number and Viewpoint Location[a]	Type of View	Approximate Viewing Distance to LCSD
1. Skyline Boulevard (Figure 5.3-2)	Scenic Highway – view from the road	100 feet
2. Vista Point (Figure 5.3-4)	Scenic overlook and trailhead parking area	100 feet
3. Sawyer Camp Trail (Figure 5.3-5)	Recreation trail – acute angle	0.25 mile
4. Crystal Springs Road (Figure 5.3-3)	County-designated scenic route – direct view	900 feet

[a] See Figure 5.3-1 for viewpoint locations.

Visual Simulations

Visual simulations were produced for each of the key observation points where visual sensitivity was rated as high (see Table 5.3-1). These simulations illustrate the appearance of the proposed changes at the LCSD from the four selected key observation points. As discussed in Chapter 3, Project Description, the Skyline Boulevard Bridge would be demolished before the LCSDI project begins, and the new bridge would be constructed after the SFPUC completes all dam modifications. Because of the close coordination of these two projects and the dominant long-term effect of the Skyline Boulevard Bridge on the appearance of the LCSD, the visual simulations used in this analysis evaluate the visual effects of the future condition with the new bridge in conjunction with the proposed dam modifications.

The visual simulations are presented with two images per page: the top image is a photographic view showing the existing visual condition, and the bottom image is a visual simulation depicting the proposed dam and bridge improvements. The evaluation of potential visual impacts associated with the LCSDI project includes both a comparison of the "before" and "after" visual conditions as portrayed in the simulated images and a qualitative assessment of the degree of visual change that would result from the project.

5.3.3.3 Impact Summary

Table 5.3-3 summarizes the potential visual impacts and significance determinations associated with implementation of the LCSDI project.

TABLE 5.3-3
SUMMARY OF IMPACTS – AESTHETICS

Impact	Significance Determination	
	LCSD Site	**Sampling Station Site**
Impact AE-1: Construction-related impacts on scenic resources (vistas, roadways, and designated scenic areas) or the visual character of the site and its surroundings.	PSM	N/A
Impact AE-2: Effects of light or glare during nighttime construction.	PSM	N/A
Impact AE-3: Permanent impacts on scenic resources (vistas, roadways, and designated scenic areas) or the visual character of the site and its surroundings.	LS	N/A
Impact AE-4: Long-term visual effects due to inundation of shoreline woodlands.	PSU	N/A
Impact C-AE: Cumulative impacts on scenic resources (vistas, roadways, and designated scenic areas) or the visual character of the site and its surroundings.	LS	N/A

B = Beneficial impact
N/A = Not Applicable or no impact
LS = Less than Significant impact, no mitigation required
SM = Significant impact, can be Mitigated to less than significant
PSM = Potentially Significant impact, can be Mitigated to less than significant
SU = Significant Unavoidable impact
PSU = Potentially Significant Unavoidable impact

5.3.3.4 Construction Impacts

Impact AE-1: Construction-related impacts on scenic resources (vistas, roadways, and designated scenic areas) or the visual character of the site and its surroundings.

The proposed dam improvements could result in construction-related impacts on scenic vistas and on the visual character of the construction sites and the area surrounding the LCSD site due to the project's close proximity to several scenic resource areas, including the vista point, Skyline Boulevard, Crystal Springs Road, and the Sawyer Camp Trail.

Construction Activities at the Dam from Skyline Boulevard and the Vista Point

Proposed construction activities at the top of the dam are expected to take up to 14 months; however, major construction activities are scheduled to occur for a 9-month period between March and November 2011, and the remaining 5 months are allocated for contractor mobilization and demobilization. Throughout this construction period, activities would include demolishing unneeded structures, removing portions of the parapet walls and the spillway training walls, and constructing a new ogee spillway, heightened parapet walls, and new training walls. In addition, San Mateo County plans to demolish the Skyline Boulevard Bridge, which would occur before the proposed project begins. At the toe of the dam, major construction activities would entail removing vegetation and trees, demolishing the stilling basin and constructing a new enlarged stilling basin, and installing new riprap and streambank protection. Cranes would operate at both the north and south abutments of the dam and would lift construction equipment into place, with some construction activities possibly occurring from a barge in the reservoir. During the demolition phase, all broken concrete would be stored at Staging Areas 5, 6, 7, and 8 located at the north and south ends of the dam (see Figure 3-6 in Chapter 3, Project Description).

As described in Chapter 3, Staging Area 5 would be located on the north side of the dam within the vista point parking lot. Throughout the duration of construction activities at the top of the dam, the vista point and Skyline Boulevard would be closed and therefore temporarily inaccessible to the public. Views of the reservoir and the watershed as well as the construction activities associated with the dam and the bridge would not be accessible from the vista point and Skyline Boulevard for the 14-month duration of construction. While closure of the vista point and the bridge would prohibit recreationists from viewing the reservoir and the dam from these particular viewpoints, similar views of the reservoir are available along Skyline Boulevard and other nearby trails. For example, as described in Section 5.6, Transportation and Circulation, under Mitigation Measure M-TR-1 (Traffic Control Plan), another parking area is located approximately 0.5 mile north of the dam along the southbound shoulder of Skyline Boulevard. This pullout offers similar views of the reservoir as the vista point and provides additional parking for recreationists. In addition, the Sawyer Camp Trail, which would still be open to the public during construction, offers similar views as the vista point. Closure of the vista point and Skyline Boulevard would only temporarily reduce public visitation to these locations, and similar views of the reservoir are available at several nearby locations. Consequently, the short-term visual impact of temporary closure of the vista point and Skyline Boulevard would be *less than significant*, and no mitigation is required.

Construction Activities at the Dam from Sawyer Camp Trail

Recreationists using the Sawyer Camp Trail could potentially view construction activities occurring at the top of the dam. As shown in Figure 5.3-5 (bottom photo), southeast-facing views of the dam can be seen from this trail within a distance of approximately 0.25 mile. Although distant and temporary, views of Staging Area 8 could also be seen from this trail. However, since views of construction activities would be limited to the 14-month construction period (and possibly shorter) and because views would be relatively distant and short term, the proposed construction activities at the top of the dam would result in a *less than significant* impact on visual resources, and no mitigation is required. Furthermore, implementation of Mitigation Measure M-TR-1 (Traffic Control Plan), described in Section 5.6, Transportation and Circulation, would require that informational signs be posted near the trailhead to alert the public of the short-term construction activities occurring under the proposed project and to inform them of detours and alternate routes.

Construction Activities at the Dam from Crystal Springs Road

From Crystal Springs Road, viewers could potentially see construction equipment and construction activities, since direct views of the downstream face of the dam are available from this county-designated scenic road. Viewers from this road would see construction activities occurring at both the top and the toe of the dam. Portions of the staging areas at the toe of the dam and activities at and/or near the stilling basin would become partially visible when selected trees and shrubs are removed as part of project construction. Although construction activities would be visible from this scenic roadway, these activities would be limited to a maximum 14-month period, and views of the project site would be fleeting for motorists and bicyclists traveling on this road. For these reasons, the visual impact would be *less than significant*, and no mitigation is required.

Construction Activities at the Dam from Residential Areas and I-280

Distant views of construction activities and equipment, including cranes, platforms, a rock crusher, and concrete trucks, could be visible from residential areas near Lakeview Drive (approximately 0.35 mile northwest of the LCSD). Views of the reservoir and the watershed lands can be seen from Lakeview Drive. However, such views are partially obstructed by I-280, which parallels and is above the reservoir and dam. Furthermore, the view of the dam occupies only a small portion of otherwise unaffected panoramic views of the reservoir and watershed. The view of the dam is more distant than that of the highway. Since views of the watershed are already disturbed by the highway overhead and the dam construction would be relatively distant, the impact on residential views near Lakeview Drive due to temporary construction activities at the dam would be *less than significant*, and no mitigation is required.

As previously discussed, views of the dam are not readily available from I-280. Therefore, construction activities at the top of the dam would not be noticeable from this scenic highway and would be *less than significant*; no mitigation is required.

Potential for Construction Activities to Result in Permanent Visual Impacts

Proposed Staging Areas 5, 6, 7, and 8 (see Chapter 3, Project Description, Figure 3-6) would be located north and south of the LCSD along Skyline Boulevard, a county-designated scenic road. These areas would be used for construction offices, parking, and storage of equipment and materials, and Staging Area 7 would require excavation and grading. These could appear disturbed once construction is complete. Due to the visibility and high visual sensitivity of these locations, this would be a *potentially significant* impact. Implementation of Mitigation Measure M-AE-1 (Landscaping Plan) would ensure that these staging and construction areas are restored to their preconstruction condition. Because overall views of the watershed lands would not substantially change and implementation of Measure M-AE-1 would restore the staging areas along Skyline Boulevard to pre-project conditions, the permanent visual impact on this scenic roadway would be less than significant.

Impact AE-2: Effects of light or glare during nighttime construction.

The project would neither require permanent lighting nor result in new or long-term sources of light and glare. However, nighttime construction activities would be necessary at times at the LCSD site and could occur for up to six months. Night shift work is likely to be necessary at both the top and toe of the dam during major concrete pours and other activities where time is critical. During these shifts, site lighting would be necessary. Nighttime lighting would not be visible from Skyline Boulevard or the vista point, since these locations would be closed to the public throughout the duration of construction. Nighttime lighting could, however, be visible from residential areas located east of the LCSD and from Crystal Springs Road, resulting in a *potentially significant* impact. However, implementation of Mitigation Measure M-AE-2 (Site-Specific Construction Lighting Plan and Complaint Line) would require the SFPUC's contractor to develop a site-specific lighting plan that includes locations and methods to minimize light spillover. With this measure in place, nighttime construction lighting impacts at the dam would be reduced to a less-than-significant level.

5.3.3.5 Operational Impacts

Impact AE-3: Permanent impacts on scenic resources (vistas, roadways, and designated scenic areas) or the visual character of the site and its surroundings.

The LCSDI project would make major improvements to the dam so that it could safely pass floodwaters from the Probable Maximum Flood, which would allow the SFPUC to remove current operating restrictions on the water storage capacity of Crystal Springs Reservoir. Under the proposed future operations of the reservoir, the current maximum normal water surface elevation of 283.8 feet would be raised to 287.8 feet. This analysis focuses on the long-term visual effects associated with the dam modifications as well as the increase in water surface elevations of Crystal Springs Reservoir.

Visual Effects of Dam Modifications and Bridge Replacement

The major design features of the proposed project include the following: (1) raising the parapet wall by 9 feet; (2) widening the spillway from 88 feet to 208 feet and elevating the crest to 291.8 feet; (3) constructing new training walls to confine water within the new spillway and guide it over the dam; and (4) widening and extending the stilling basin along San Mateo Creek. The new spillway would be of the ogee type, which would have a curved shape designed to promote efficient water flow and thereby minimize the risk of structural damage to the dam. Wing walls would also be installed on the downstream face of the dam to guide water flowing into the stilling basin. Riprap would be installed at the downstream end of the stilling basin. Another potentially noticeable visual change involves the removal of a number of trees in the vicinity of the stilling basin, including an estimated 28 trees with a diameter at breast height of 12 inches or greater.

As described in Section 5.3.1, Setting, the visual quality of the surrounding area and visual sensitivity of the public in relation to the dam are considered high due to the project area's location and visibility from several scenic roads and vista points in the vicinity. Photo simulations from various viewpoints were produced in order to assess the visual changes associated with the proposed dam modifications. As previously discussed, the proposed project, as completed, would also be the site of San Mateo County's Crystal Springs Dam Bridge

Replacement Project, and the photo simulations show the new bridge as well as the proposed dam modifications, depicting the long-term post-construction conditions. The future reservoir water levels would fluctuate about the same as they do under current operations, and the average water surface elevation would be approximately 281.5 feet (see Section 5.15, Hydrology and Water Quality, Table 5.15-3). Although the current average operating level is approximately 276 feet, the photos illustrating existing conditions show water surface elevations at 281.4 feet. These photos were taken in May 2009, the time of year when water elevations tend to be higher than average. Because this level is close to the average future operating surface elevation (281.5 feet), the surface elevations appear the same in both the existing and simulated photos in Figures 5.3-2 through 5.3-5. The discussion below describes the permanent visual changes associated with the LCSDI project at the key observation points listed in Table 5.3-2.

Skyline Boulevard. Figure 5.3-2 shows "before" and "after" images of Skyline Boulevard and the Skyline Boulevard Bridge facing north. As shown in the top photo (existing conditions), views of the reservoir can be seen from a motorist's perspective, but the dam itself is not readily visible. However, once the LCSDI and bridge replacement projects are both completed, views from this perspective would be different. A comparison of the top and bottom photos shows that views of the reservoir would be diminished due to the increased height of the parapet walls proposed under the LCSDI project. It is important to note that the open metal railing design feature above the barrier wall allows for filtered views to the water. The motorist's view, however, would also be altered by the new recreational path proposed under the bridge replacement project (which would make the new bridge about 18.5 feet wider than the existing bridge). Despite these changes, the predominant views of the watershed, including the densely forested slopes to the west and the grassland hills to the east, would still be available and intact for motorists; overall views of the watershed lands would not substantially change, and this impact would be *less than significant.* No mitigation is required.

LCSD Vista Point. Figure 5.3-4 shows an existing and simulated view of both the Skyline Boulevard Bridge and the heightened parapet walls proposed under the LCSDI project. A comparison of the existing and simulated photos of the LCSD from the vista point shows that the increased height of the parapet walls and the heighted bridge would be noticeable from this viewpoint. The new training walls would be partially visible underneath the bridge; however, since the training walls would be located adjacent to the new bridge posts and would primarily be screened by the parapet walls, they would not substantially alter views of the dam. The curvature and crest of the new ogee spillway can be seen in the middle ground of the simulation; however, since the spillway would be installed at approximately the same height as the existing parapet walls, it would not noticeably alter views from the vista point. In addition, because the parapet walls are partially screened by the existing outlet tower and because views of the vegetated hillsides in the background would remain intact, the permanent visual impact of the dam modifications on this view would be *less than significant*, and no mitigation is required.

Sawyer Camp Trail. Figure 5.3-5 shows an existing and simulated view of the proposed dam modifications and the proposed Skyline Boulevard Bridge from the Sawyer Camp Trail (approximately 0.25 mile away). With close attention, recreationists could notice the elevated bridge, widened spillway, and heightened parapet walls from this viewpoint. However, since this view is relatively distant, these proposed changes would not be very noticeable. Views from this trail are mainly focused on the reservoir and the surrounding shoreline vegetation. For these reasons, the permanent visual impact of the dam modifications on this recreational trail would be *less than significant*, and no mitigation is required.

Crystal Springs Road. Figure 5.3-3 shows an existing and simulated view of the proposed dam modifications and the proposed Skyline Boulevard Bridge from Crystal Springs Road. Direct views of the downstream face of the dam can be seen from this location along Crystal Springs Road. As shown in the bottom photo of Figure 5.3-3, once construction of the dam and bridge are complete, the following modifications would be visible: the heightened bridge, the heightened parapet walls, the new training wall, the downstream face of the spillway, and the top portion of the southern wing wall. In addition, the removal of numerous mature trees near the stilling basin and Staging Area 1 would open up views of the lower portion of the dam spillway. The heightening of the dam and bridge would slightly diminish views of the forested ridges in the background. Although views of the dam would become more apparent and views of the ridges in the background would be slightly reduced, the overall visual character of the view would not substantially change. The presence of vegetation and trees lining the roadway as well as the proposed restoration of vegetated areas along San Mateo Creek near the stilling basin would screen views of the expanded stilling basin. Therefore, the permanent visual impact of the dam modifications on Crystal Springs Road would be *less than significant*, and no mitigation is required.

Impact AE-4: Long-term visual effects due to inundation of shoreline woodlands.

The proposed changes in reservoir operations and associated changes in water surface elevations would alter the inundation pattern and raise the elevation of the inundation zone around the perimeter of Crystal Springs Reservoir. As described in detail in Section 5.13, Biological Resources and Appendix J, raising the reservoir operating levels would potentially affect 488.6 acres of shoreline vegetation, which could convert from of one vegetation/habitat type to another in response to the changes in inundation frequency. Depending on numerous factors (e.g., elevation, inundation frequency, slope, etc.), existing wetland habitat would be converted to deepwater habitat, grassland habitat would be converted to wetland habitat, and upland woody vegetation would be converted to wetland or grassland, and species composition within a given habitat type would change. The conversion of grassland habitat to wetland habitat as well as the change in wetland habitat to lacustrine habitat around the perimeter of the reservoir would generally appear consistent with the visual character of the watershed and would not significantly alter the appearance of the landscape.

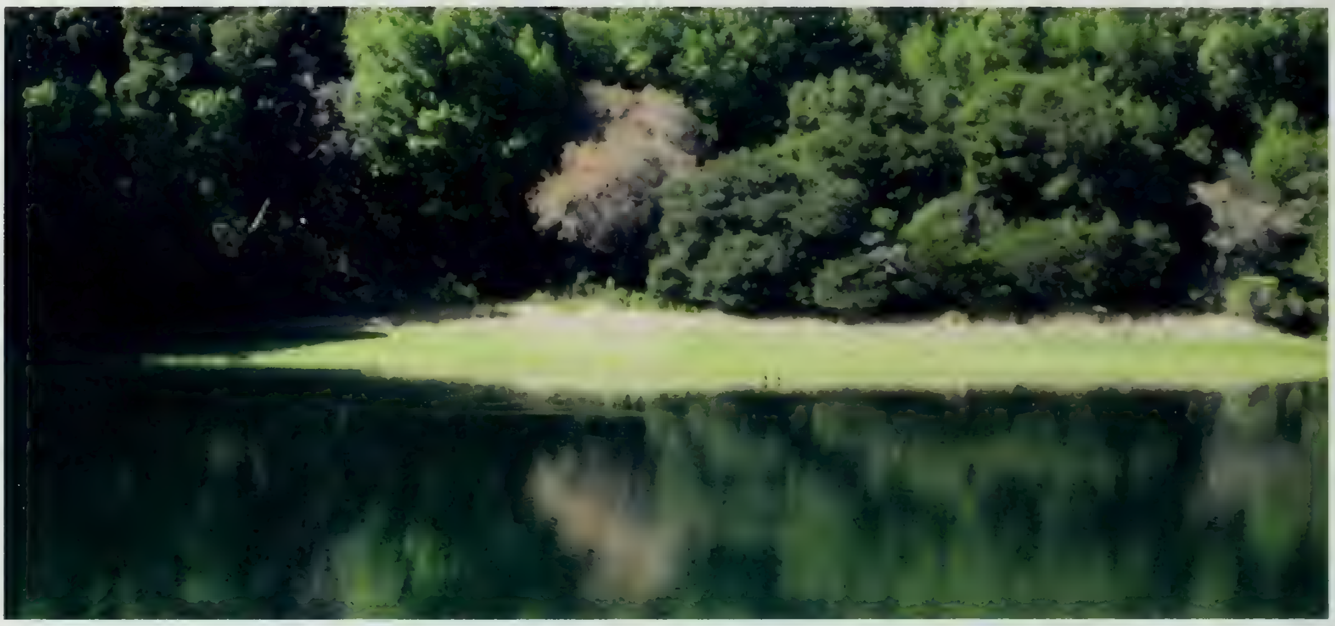
However, as shown in Table 5.13-4 and explained in Section 5.13, Biological Resources, it is estimated that approximately 31.1 acres of shoreline upland forest vegetation would be lost due to the proposed increase in the maximum normal operating level of Crystal Springs Reservoir from 283.8 to 287.8 feet. This vegetation type consists of coast live oak forest (loss of 19.6 acres), mixed evergreen (loss of 9.5 acres), and non-native woodland habitat (loss of 2.0 acres).

In addition, up to 19.1 acres of combined oak (12.0 acres), mixed evergreen (5.3 acres), and non-native woodland (1.8 acres) could be lost due to the periodic exceedances that would occur under the proposed operations when water levels would exceed 287.8 feet. As described in Chapter 3, Project Description, Section 3.7, the SFPUC would allow the reservoir level to exceed the maximum normal water surface elevation occasionally. Water surface elevations would exceed 287.8 feet for short durations (up to 14 days) and could be as high as elevation 291.8 feet during the rainy season (November through April). The frequency and duration of exceedances would depend on hydrologic and meteorological conditions, but such exceedances would allow the SFPUC to maximize the capture of local runoff from the Peninsula watershed. The loss of the predicted extent of upland forest vegetation along the shoreline of Crystal Springs Reservoir—due to the increased maximum reservoir operating level as well as to the occasional exceedances—would result in noticeable visual changes from existing conditions in the form of dead and dying trees along the shoreline.

Shoreline woodlands are valuable aesthetic resources in any setting and are particularly valuable in the project area because they are completely within GGNRA's Scenic Easement, and many of the shoreline woodlands are visible from other scenic resources in the area. As described in Section 5.3.1, Setting, shoreline woodlands around Crystal Springs Reservoir are visually sensitive resources because of their location at the water's edge. The human eye is naturally drawn to the water's edge because of the reflected patterns in the water and the fact that the shoreline vegetation is doubled in size by these reflections. Additionally, many of the shoreline woodlands are highly visible from several of the designated scenic resources that surround the reservoir, including Sawyer Camp Trail, Skyline Boulevard, Highway 92, and Cañada Road.

As described in Section 5.3.2, above, numerous oak trees in the Peninsula watershed have been killed by SOD, and infected trees are commonly seen throughout the watershed. These infected trees are intermittently visible within the forest and sometimes on the shoreline. **Figure 5.3-7** shows a representative photo of a SOD-infected oak tree along the reservoir's edge. While SOD caused the death of the tree in this photo, its appearance is similar to the visual effect that inundation changes due to proposed reservoir operations would have on oak trees around the reservoir shoreline. During the initial seasons following increased reservoir operating levels, the brown leaves of dead trees would remain visible on the shoreline, and the visual effect of these dying trees would be exaggerated by other dying trees along the shoreline, where they would be reflected in the water and contrast with the surrounding greenery.

The dead tree shown in Figure 5.3-7, as with many trees currently infected with SOD within the watershed, is part of the existing setting; it did not die as a result of inundation. However, as shoreline water levels rise under future operating conditions, inundation would weaken trees within the modified shoreline zone and SOD infections could become more common in this area as trees become weakened by the rising water (see Section 5.13.3.5, Biological Resources, Operational Impacts for further discussion). The visual effect of a dead tree covered in brown leaves along the shoreline would be the same whether caused by inundation or by SOD, and the two causes of death would become indecipherable (except upon close inspection of the oozing fissures in the bark of SOD infected trees). In either case, when the water levels rise, dead trees within the modified shoreline zone would be attributable to the increased inundation frequency.



This small Oak has died from Sudden Oak Death as indicated by the complete browning of retained leaves. Water inundation caused by rising reservoir levels around tree trunks and roots would cause similar symptoms in shoreline oaks and evergreens.

SOURCE: ESA

Figure 5.3-7
Example of a Dying Tree Reflected at the Shoreline of Crystal Springs Reservoir

Therefore, increased surface water levels as a result of proposed reservoir operations would degrade views within the scenic easements as well as from designated scenic resource in the area since all trees (being the most flood-sensitive species, see Section 5.13.3.5, Biological Resources, Operational Impacts for further discussion) along the inundated shoreline may die, leaving very noticeable linear patches of dead trees along the shoreline.

Using the same vegetation maps with LiDAR elevation data as those used in Section 5.13, Biological Resources, ESA staff conducted a visibility field analysis on September 25, 2009 to identify where trees would likely die and the degree to which those trees would be visible from public viewpoints. Overall, it was determined that approximately two thirds of all trees lost due to inundation would be visible from public areas, or about 27 acres total.

The primary locations from which dead trees along the shoreline would be visible to the public would be the following:

Lower Crystal Springs Reservoir

- *Views from Sawyer Camp Trail*: Several west-facing views across the reservoir of oaks and mixed evergreens along the western perimeter of the reservoir as well as views within inlets on the eastern side of the reservoir which have visible woodlands that would be affected by inundation.

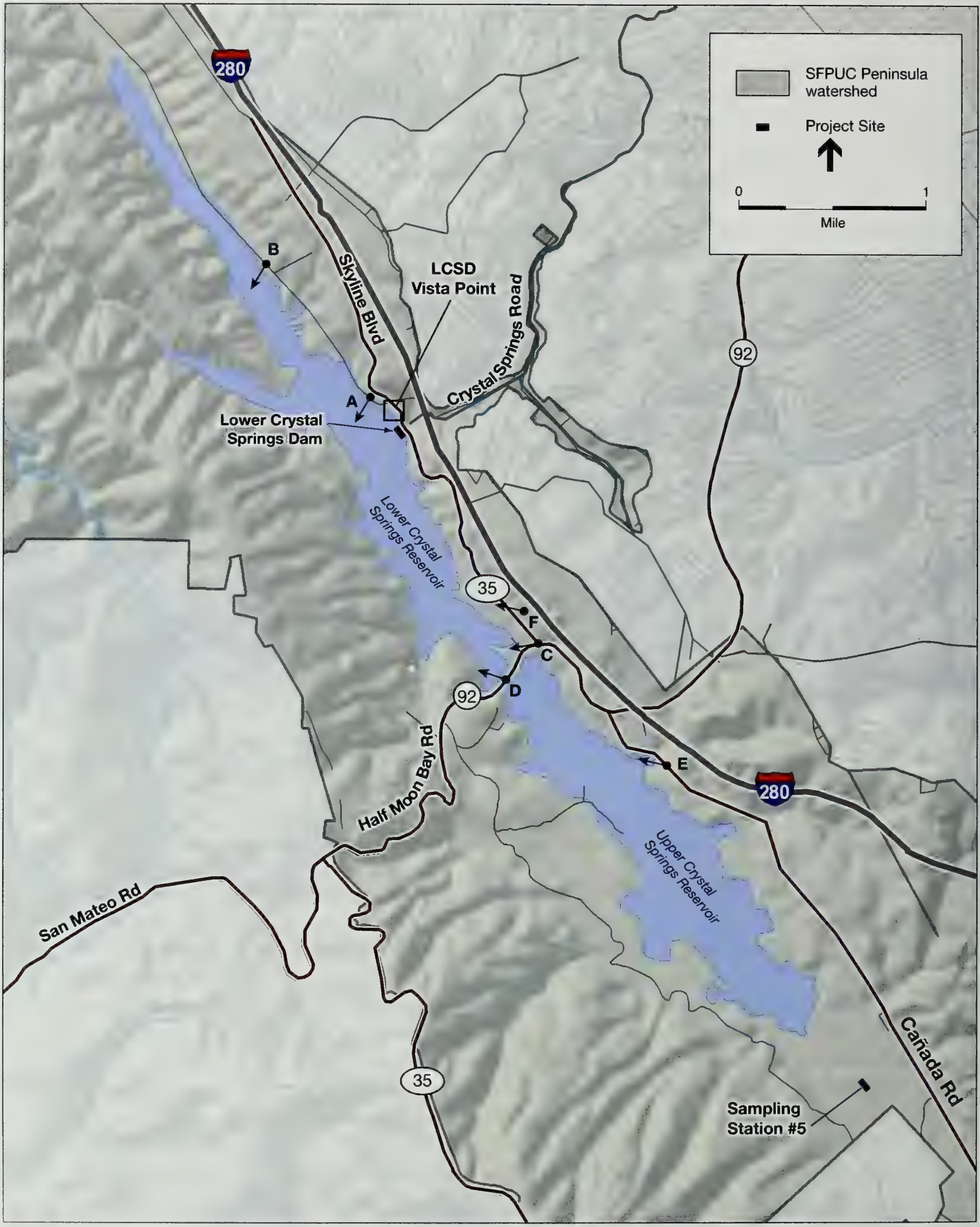
- *Views from Skyline Boulevard*: West-facing views of oaks and non-native woodland trees at the southeastern end of the reservoir and views from the intersection of Skyline Boulevard and Highway 92 (near the Highway 92 causeway).

- *Views from the Highway 92 causeway*: West- and north-facing views of mixed evergreen trees along the southwestern portion of Lower Crystal Springs Reservoir.

Upper Crystal Springs Reservoir

- *Views from Cañada Road*: A west-facing view of oaks located within an inlet on the eastern shore. (Vegetation projected to be lost on the west side of the reservoir would not be visible.)

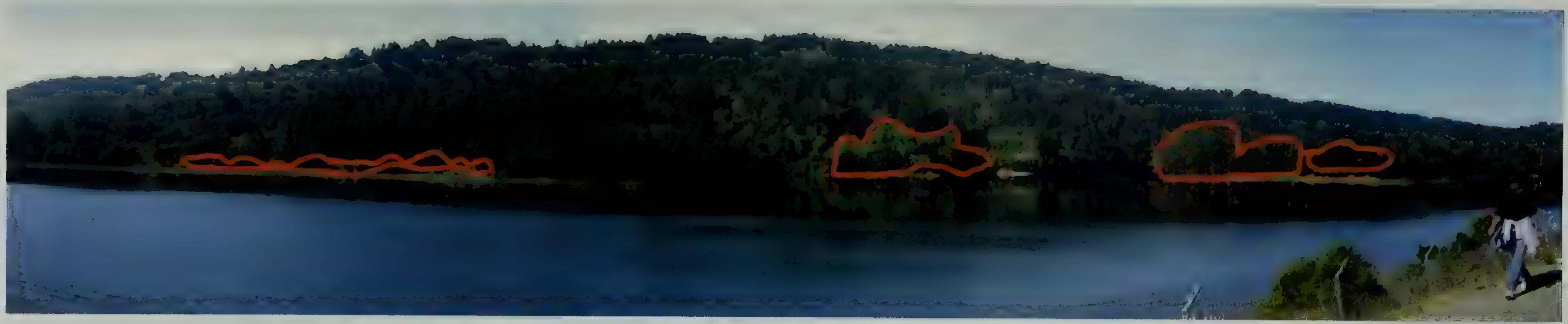
Figures 5.3-9 and **5.3-10** depict the above-listed views of shoreline vegetation including patches of oak, mixed evergreen, and non-native woodland habitats (highlighted in orange) that would likely die due to future inundation under the proposed future reservoir operations. The viewpoints of these photos are indicated in **Figure 5.3-8**. **Figure 5.3-11** shows an existing and simulated view of a possible LCSDI project mitigation site (Boat Ramp Fountain Thistle Enhancement, described in Section 5.13.3.6, Biological Resources, Mitigation Measures) located adjacent to Skyline Boulevard. As indicated in the middle simulated photo of Figure 5.3-11, this mitigation site would include removal of non-native pine trees. The removal of these trees could potentially open up views of shoreline oak woodlands and other vegetation that would likely die due to future inundation as a result of proposed operations (refer to bottom photo of Figure 5.3-11). In addition, the vegetation maps shown in **Figure 5.3-12** show where large patches of oak, mixed evergreen, and non-native woodland habitats (circled in yellow) would likely die due to future elevated reservoir levels.



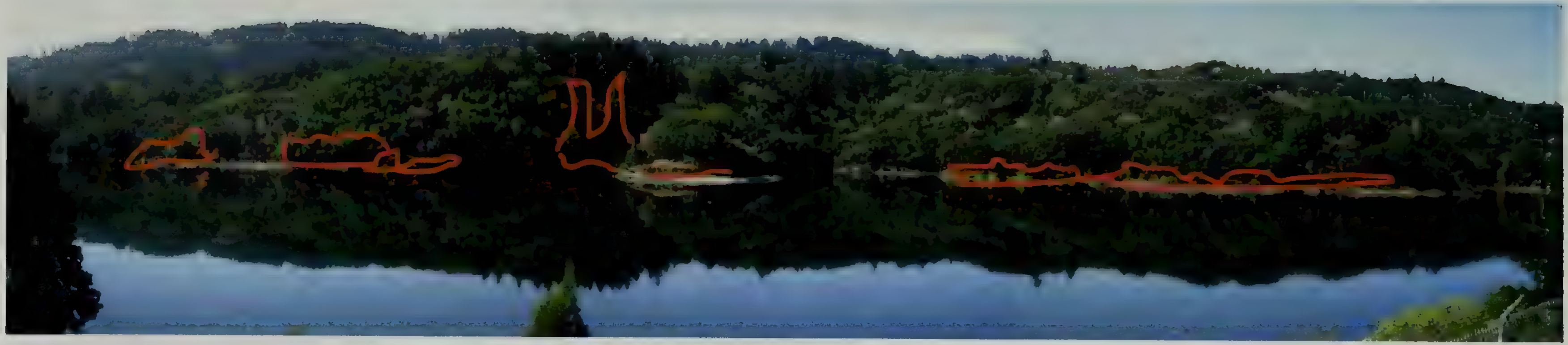
SOURCE: ESA + Orion, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.3-8
Photo Viewpoint Locations of Shoreline Vegetation



A. Western-facing view of Lower Crystal Springs Reservoir and shoreline vegetation from Sawyer Camp Trail entry.



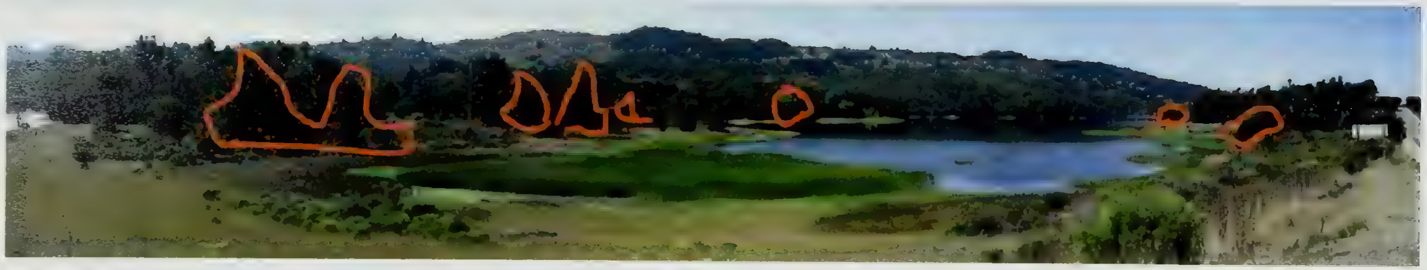
B. Western-facing view of Lower Crystal Springs Reservoir and shoreline vegetation from Sawyer Camp Trail (1/4 mile north from trail entrance).

— Trees that would likely die due to inundation as a result of proposed operations

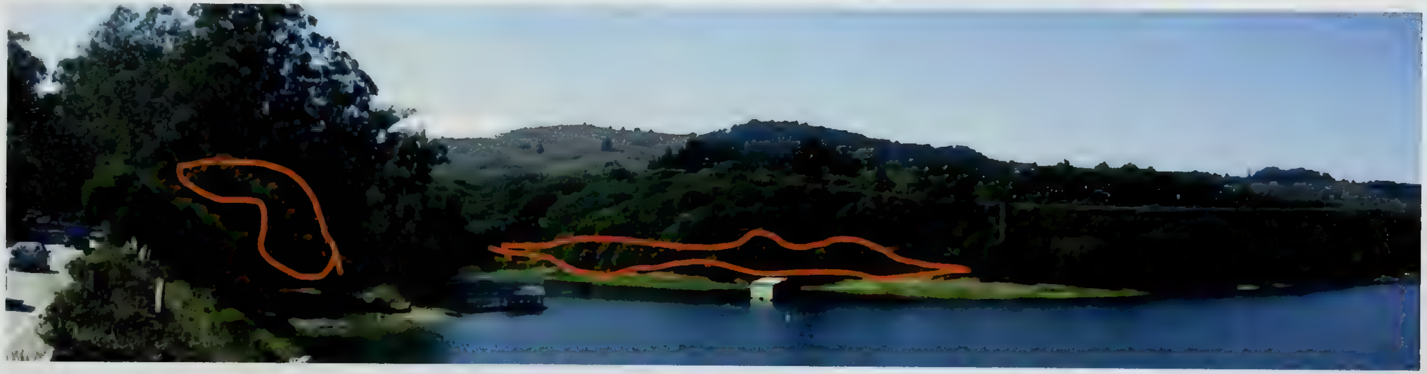
SOURCE: ESA + Orion, 2009

SFPUC Lower Crystal Springs Dam Improvements

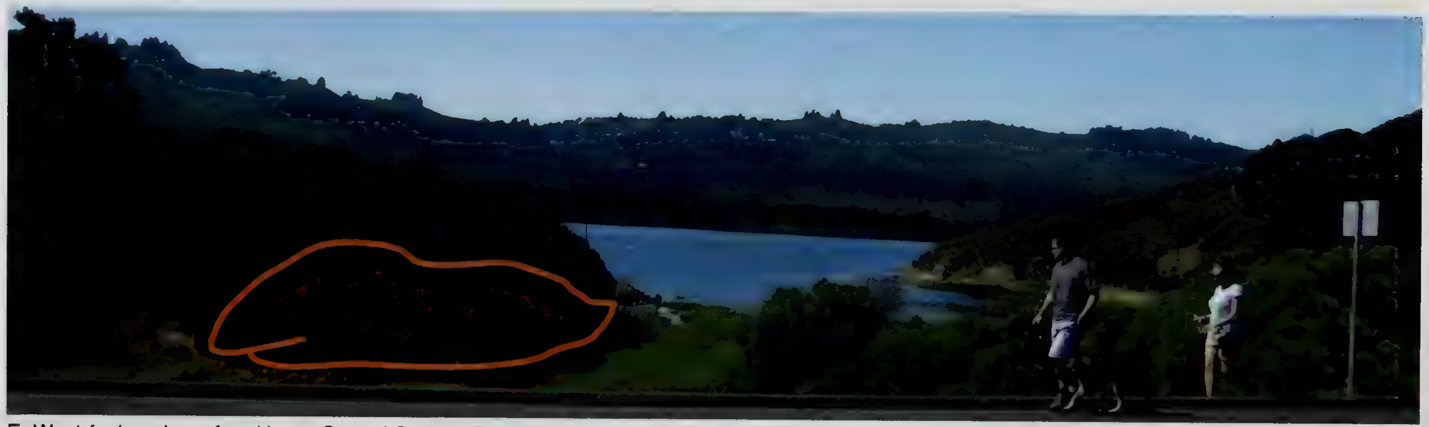
Figure 5.3-9
Visual Effects of Inundation on Shoreline Woodlands from Sawyer Camp Trail



C. Northwest-facing view of Lower Crystal Springs Reservoir and shoreline vegetation from Skyline Boulevard and Highway 92 intersection.



D. Northwest-facing view of Lower Crystal Springs Reservoir and shoreline vegetation from Highway 92 causeway.



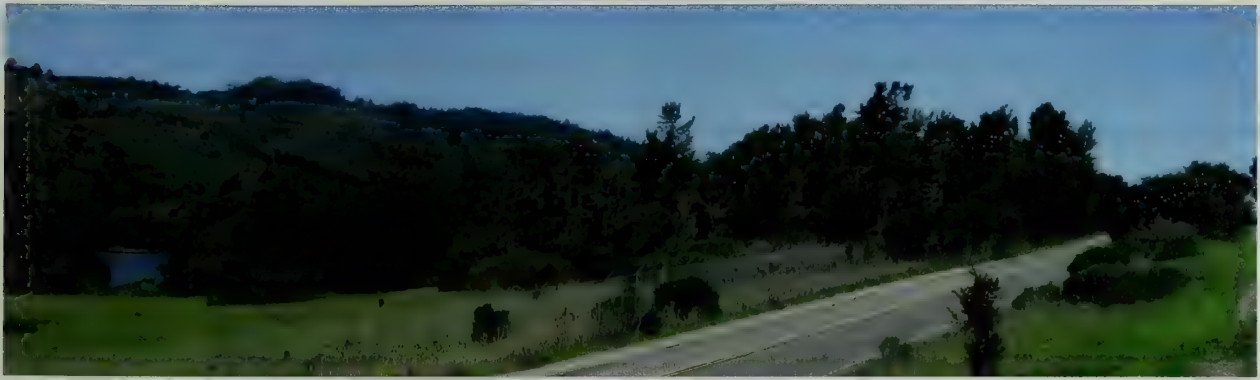
E. West-facing view of an Upper Crystal Springs Reservoir inlet from Cañada Road.

— Trees that would likely die due to inundation as a result of proposed operations

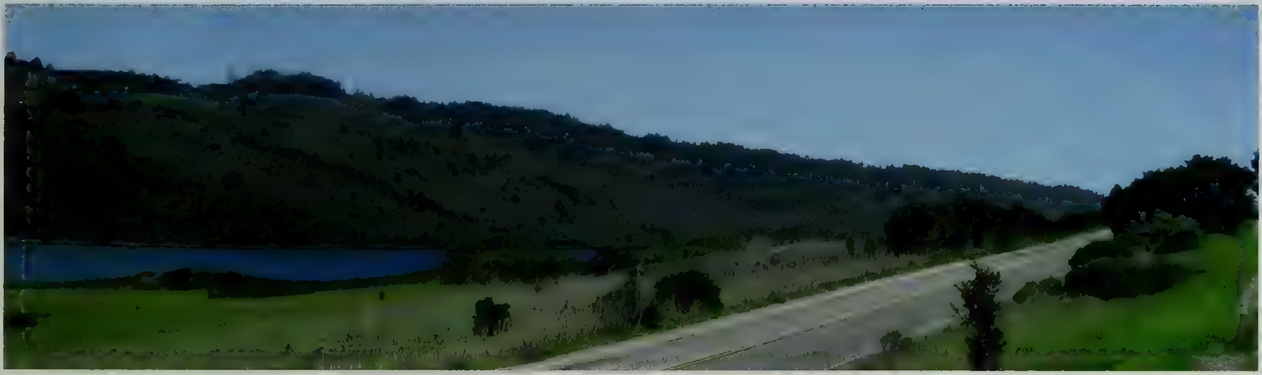
SOURCE: ESA + Orion, 2009

SFPUC Lower Crystal Springs Dam Improvements

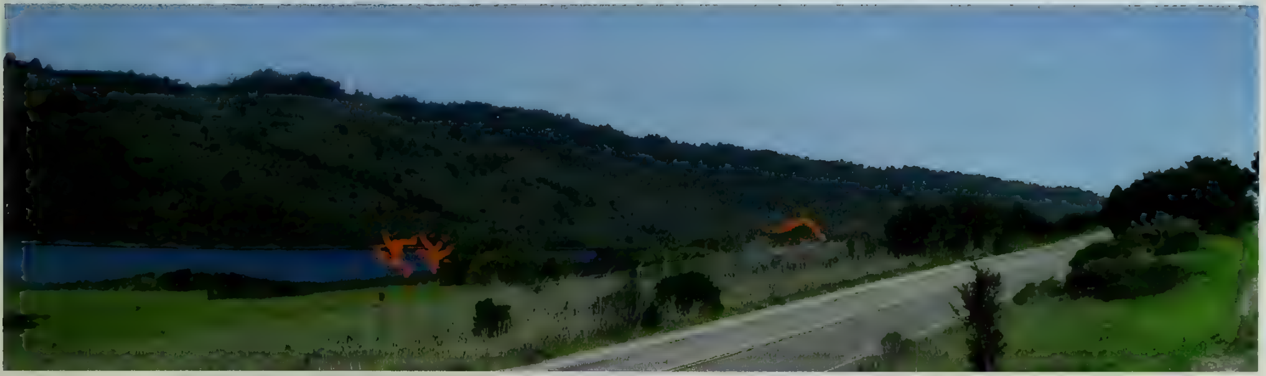
Figure 5.3-10
Visual Effects of Inundation on Shoreline Woodlands from Highway 92 and Cañada Road



F. Existing view of possible mitigation site (Boat Ramp Fountain Thistle Enhancement).



Simulated view of mitigation site (Boat Ramp Fountain Thistle Enhancement) showing view after removal of non-native pine trees.

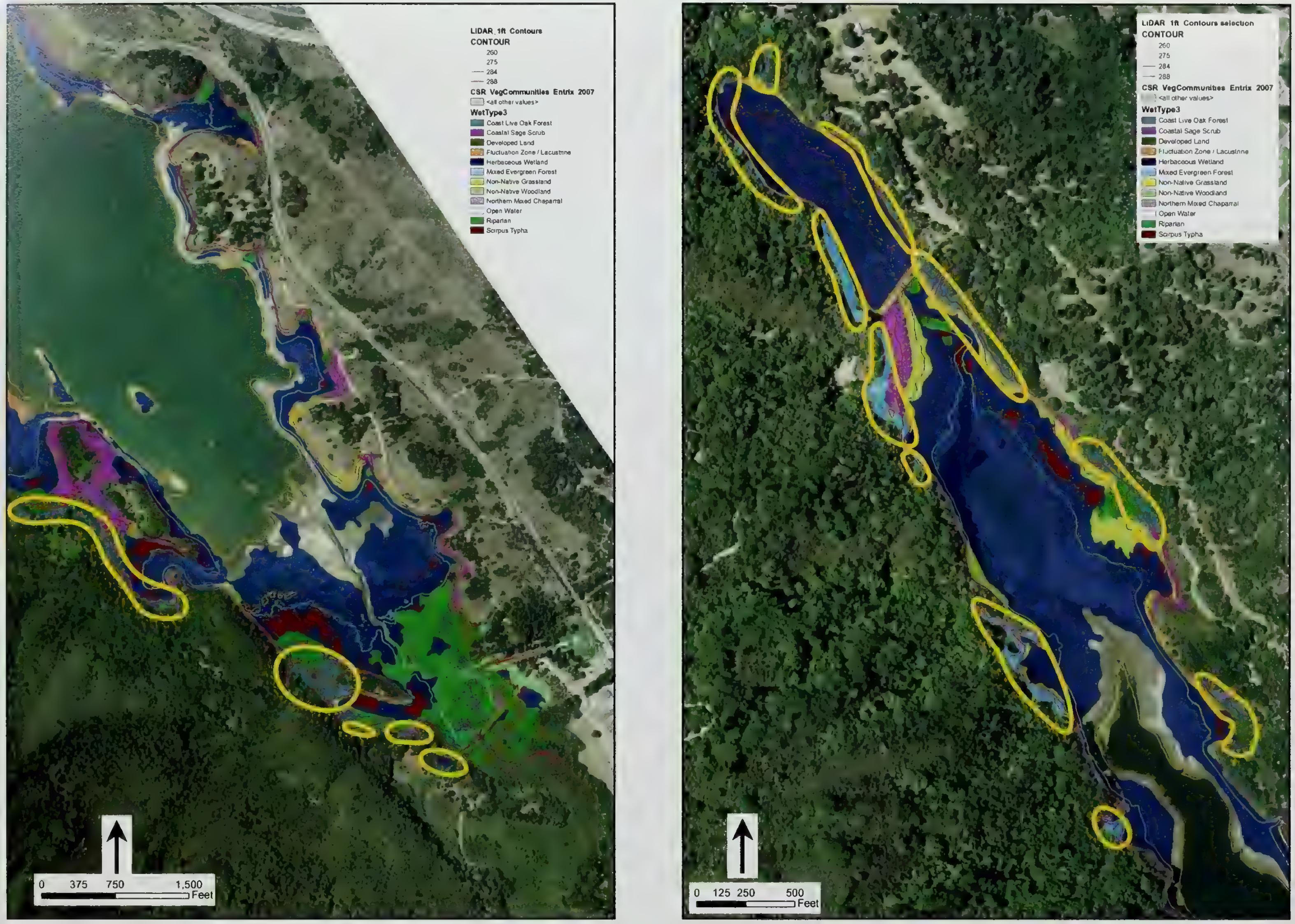


Potential view of dead oak trees along shoreline as a result of proposed operations once non-native pine trees have been removed at Boat Ram Fountain Thistle Enhancement site.

▬ Trees that would likely die due to inundation as a result of proposed operations

SOURCE: ESA + Orion, 2009

Figure 5.3-11
Visual Effects of Inundation on Shoreline Vegetation from Skyline Boulevard



Southern end of Upper Crystal Springs Reservoir

Northern end of Lower Crystal Springs Reservoir

Indicates location of Upland forest vegetation likely to be lost due to proposed operations

SOURCE: ESA + Orion, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.3-12

Vegetation Maps Showing Potential Areas of Inundation in Upper and Lower Crystal Springs Reservoirs

As indicated in Figures 5.3-8 through 5.3-11, the shoreline woodlands and individual trees that would die from project-induced inundation would be very visible from several designated scenic resources such as Sawyer Camp Trail, Skyline Boulevard, and Cañada Road. Since all inundated shoreline woodlands would be within GGNRA's Scenic Easement and the shoreline vegetation is a focal point within this highly visually sensitive resource, the death of shoreline trees as a result of future reservoir operations would substantially degrade the aesthetic quality of the reservoir and would degrade the existing visual character and quality of the site and its surroundings. Therefore, the proposed project operations would result in a *significant* impact on these scenic resources.

To the extent feasible, this impact could be reduced to a less-than-significant level through implementation of Mitigation Measure M-AE-4 (Tree Removal Plan), which would require the SFPUC to develop and implement a plan to remove dead trees in the inundation zone that are visible from public viewpoints and are reasonably accessible by existing roadways or, water, or helicopter. Removal of the dead trees along the shoreline would eliminate the line of dead trees along the reservoir's shoreline induced by future reservoir operations. With ongoing implementation of this measure as the trees die in response to the changes in reservoir operations, the resultant, long-term appearance of the reservoir and watershed would be comparable to the existing conditions. There would be a different mix of grassland, wetland, and woodland vegetation, as the vegetation and habitat types gradually adjust to the changes in inundation frequency and reservoir operating levels, but the overall views of the reservoir and watershed would be similar to existing conditions.

Even with implementation of Mitigation Measure M-AE-4, however, the SFPUC might not be able to remove dead or dying trees at locations where there is potential for significant adverse impacts on special-status species even with application of mitigation measures. Similarly, there may be tree death in locations that are not reasonably accessible by existing roadways, water, or helicopter. To the extent that the Tree Removal Plan may prove infeasible in some locations where significant aesthetic impacts would occur, the LCSDI project could therefore result in a *potentially significant and unavoidable* aesthetic impact.

5.3.3.6 Mitigation Measures

Mitigation Measure M-AE-1: Landscaping Plans.

The SFPUC shall prepare and implement landscaping plans to restore project sites to their preconstruction condition such that short-term construction disturbance does not result in long-term visual impacts. To retain the existing visual character of the site and surrounding area, disturbed areas shall be recontoured, revegetated, and repaved to restore preconstruction conditions. Note that some areas consist of bare ground and would not require significant restoration once construction is complete. Landscape restoration shall include pruning of remaining vegetation for maximum vigor and opening of new "view windows" to frame views of the reservoir, dam, and bridge. Landscape plantings shall include non-invasive, and, where possible, native grasses, shrubs, and trees similar to those in the existing landscape. The SFPUC shall monitor landscape plantings annually for five years after project completion to ensure that sufficient ground coverage has developed and shall implement additional measures, such as replanting or installing temporary irrigation systems, as determined necessary.

Mitigation Measure M-AE-2: Site-Specific Construction Lighting Plan and Complaint Line.

The SFPUC shall require the contractor to develop and implement a site-specific nighttime lighting plan. A qualified lighting professional shall prepare the plan, which shall specify lighting sources for nighttime operations and require that lighting be shielded and directed specifically onto work areas to minimize light spillover. The plan shall also provide for light source monitoring to ensure that feasible adjustments are made as necessary to provide maximum shielding during all phases of construction. The contractor shall submit the plan to the SFPUC for review and approval prior to commencing nighttime construction operations, at which time the plan shall be implemented continuously until the end of nighttime construction. In addition, the SFPUC shall provide a toll-free number in the SFPUC neighborhood notice (as required per SFPUC's Standard Construction Measures) for the public to report problems regarding lighting and other construction-related complaints. The SFPUC shall take corrective action in response to complaints regarding misdirected lighting within three business days of the complaint.

Mitigation Measure M-AE-4: Tree Removal Plan.

Prior to the removal of any trees along the Crystal Springs Reservoir shoreline, the SFPUC shall prepare a Tree Removal Plan to mitigate the long-term effects (10 years minimum) of inundation on shoreline woodlands. The purpose of the Tree Removal Plan is to identify a systematic approach that identifies the best means of removing dead trees resulting from inundation without causing harm to the watershed's biological diversity and water quality and that limits the removal activities to one-time per year. The Tree Removal Plan will be prepared by a qualified team of foresters, biologists, planners with visual resource expertise, and water quality resource experts. Following full implementation of the proposed increase in maximum normal operating levels in both Upper and Lower Crystal Springs Reservoirs, the SFPUC shall implement the Tree Removal Plan as necessary, depending on the specific operational changes in reservoir water levels (i.e., as related to meteorological and hydrological conditions, customer demand, maintenance, outages, exceedances, etc.).

In developing this plan, the SFPUC shall consider the following criteria to determine the feasibility of removing trees along the shoreline:

- Trees must be dead or dying before they are removed.
- Trees are highly visible from key public viewpoints and other publicly accessible places.
- Trees are readily accessible either by an existing watershed access road, by boat, or helicopter.

- Any potential adverse impacts to water quality would be eliminated with implementation of Best Management Practices, particularly at stream crossings and for erosion control.
- No new roads would be constructed for the purposes of tree removal.
- Tree removal would not result in substantial adverse impacts to special-status biological resources and/or sensitive habitats such as wetlands, aquatic, and oak woodlands.

Elements of the Tree Removal Plan

GIS maps of vegetation types overlaid with Crystal Springs Reservoir level contours (see Figure 5.3-12) and special status species locations will help SFPUC to identify potential tree removal areas that are readily noticeable from public viewpoints along scenic resources (e.g., Sawyer Camp Trail, Skyline Boulevard, Highway 92, and Cañada Road). Trees which are not highly visible from public locations within the watershed, or are only visible from less-utilized remote viewpoints, do not need to be removed. (Some areas not visible to the public include upper San Mateo Creek and the far west side of Upper Crystal Springs Reservoir.) The Tree Removal Plan shall consider the above-listed criteria and shall also consider the overall site conditions, slope stability, and potential effects related to biological and water resources, traffic, and nearby recreational uses to weigh the feasibility, the visual benefits and potential effects of tree removal.

The Tree Removal Plan shall include the following elements:

- *GIS maps of vegetation types overlaid with Crystal Springs Reservoir level contours*. SFPUC shall use mapped GIS data to coordinate potential tree removal areas with locations of known protected biological species and water courses and to determine applicability of additional biological and water quality protection measures (described below).
- *Methodology*. SFPUC shall provide a description as to how the tree removal site would be accessed (i.e., via boat, existing access road, or helicopter). The means selected for access to the affected trees shall comply with all applicable biological mitigation procedures (which are summarized below) such that tree removal activities do not cause damage to protected biological resources or water quality.

  This section of the plan shall also describe methods of tree removal. SFPUC shall cut down flush to grade and remove selected mature trees (defined as trees greater than 4 inches in diameter at breast height) from designated shoreline oak woodlands, mixed evergreen forests, and non-native woodlands that die from inundation as a result of post-project reservoir operations.
- *Protection/avoidance measures*. Particular consideration shall be given to avoiding sensitive species, protecting water quality, and preventing erosion, particularly at stream crossings. A qualified biologist shall make a site-specific determination of the sufficiency of the biological mitigation measures described below to prevent significant adverse impacts to special-status biological resources. If mitigation measures would not prevent such impacts or tree removal is not feasible due to site-specific access conditions, then the SFPUC shall not remove the dead trees. The following mitigation measures identified in Section 5.13, Biological Resources, shall be implemented to minimize impacts to sensitive biological resources near selected tree removal sites:

  - Mitigation Measure M-BI-1a, Worker Training Program
  - Mitigation Measure M-BI-1b, Avoidance and Restoration
  - Mitigation Measure M-BI-2, Individual Tree Replacement
  - Mitigation Measure M-BI-3c, Biological Monitoring
  - Mitigation Measure M-BI-3d, Preconstruction Surveys and Avoidance of Nesting Birds
  - Mitigation Measure M-BI-3g, General Avoidance Measures

  To avoid adverse effects on water quality, applicable best management practices (BMPs) from Mitigation Measure M-HY-3 (Preparation and Implementation of a SWPPP) shall also be included. In particular, erosion and sedimentation BMPs and the reservoir protection BMP shall be included in the Tree Removal Plan. See Section 5.15, Hydrology and Water Quality, for details.

- *Sudden Oak Death protocols*. The Tree Removal Plan shall be consistent with San Mateo County's Sudden Oak Death (SOD) protocols. The San Mateo County agricultural commissioner is the local enforcement agent for state and federal SOD regulations. To prevent the spread of this disease to uninfected areas, San Mateo County's agricultural commissioner regulates the movement of wood and plant materials consistent with state and federal regulations.

  Unless a compliance agreement is obtained from the County's agricultural commissioner, San Mateo County prohibits the transportation of SOD-infected material (i.e., bark chips, mulch, or proven SOD hosts located or grown in San Mateo County) outside the quarantined area. This area includes San Mateo County and most Bay Area counties as SOD has spread throughout much of the Bay Area. However, since there are still areas within San Mateo County that have not been exposed to SOD, the Agriculture Commissioner prefers that all SOD-infected material be chipped and left onsite (Eide, 2009). If chipped material cannot be left onsite, SFPUC shall abide by basic SOD protocols, including:

  - Chipping of wood should take place as close as possible to the harvested areas until chipped material is enclosed in a sealed container (if transporting away from harvested area)(Baker, 2009);
  - Shipping of wood materials possibly carrying the SOD pathogen (chipped or not) shall be enclosed in a sealed container pursuant to California Code of Regulations Section 3700, 7 CFR 301.92, and subject to county transportation restrictions (Baker, 2009);
  - Any SOD-infected material that requires movement outside a quarantined area is subject to a compliance agreement with San Mateo County's agricultural commissioner (Eide, 2009).

- *CAL FIRE Timber Removal Procedures*. The Tree Removal Plan shall also generally conform to accepted timber operations practices such as those governed by the Forest Practice Rules currently regulated by the California Department of Forestry and Fire Protection (CAL FIRE). Commercial revenue will not be generated from the removal of dead trees from along the shoreline, and therefore the CAL FIRE Forest Practice Rules (and elements of the Timber Harvest Planning protocol) shall be advisory only and shall not limit the removal of dead trees from otherwise sensitive locations such as steep slopes and riparian areas next to the shoreline. Conformance to biological mitigation and/or water quality protection measures could, however, limit or prevent removal of dead trees in these most sensitive areas.

- _SFPUC Watershed Maintenance Activities._ Whenever possible, the Tree Removal Plan shall integrate applicable SFPUC watershed maintenance activities to support long-term management objectives of the tree removal areas.

Implementation: Visual Site Analysis and Annual Tree Removal

After the Tree Removal Plan has been completed and the effects of reservoir inundation become apparent, the SFPUC shall visually assess the health of the trees around the perimeter of the reservoir. Each year, annually for the following ten years, SFPUC shall determine if any dead or dying trees, that are visible from public viewpoints require removal as a result of inundation. It is estimated that approximately two thirds of all the trees that may die from inundation (about 27 acres over the ten year period) would be visible and shall need to be removed where feasible. Each year the SFPUC shall identify which dying trees are subject to removal and remove them in accordance with the guidelines established in the Tree Removal Plan.

5.3.3.7 Cumulative Impacts and Mitigation Measures

Impact C-AE: Cumulative impacts on scenic resources (vistas, roadways, and designated scenic areas) or the visual character of the site and its surroundings.

The geographic scope of potential cumulative impacts related to visual resources includes the regional setting described above, including overall views of the Peninsula watershed with Crystal Springs Reservoir as the predominant feature, as well as the immediate views in the vicinity of the LCSD. When potential project impacts on visual resources are considered in combination with the impacts of the other planned and proposed projects listed in Table 5.1-1, there could be the potential for cumulative visual effects during both the construction and long-term operational phases of the project.

Construction Projects in the Lower Crystal Springs Dam Vicinity

Construction projects in the immediate vicinity of the LCSD that would likely overlap with the project's construction schedule include San Mateo County's Crystal Springs Dam Bridge Replacement project (described above), the SFPUC's Crystal Springs/San Andreas (CSSA) Transmission Upgrade project, PG&E's Jefferson-Martin Transmission Line project, and possibly the southern end of the SFPUC's Crystal Springs Pipeline No. 2 (CSPL2) Replacement project. These projects would include construction activities either at or adjacent to the top or toe of the dam. Potential cumulative impacts due to the combined construction of these projects would result in more severe impacts—either in magnitude or duration—on the visual resources that have high visual quality and sensitivity, as described in Section 5.3.1, Setting, above. There would be a greater quantity of construction equipment and vehicles and/or a longer duration of construction activities.

San Mateo County's Crystal Springs Dam Bridge Replacement project would be conducted in sequence with the LCSDI project, extending the duration of construction activities at the top of the dam by six months prior to the LCSDI project and by 12 months after its completion. The PG&E Jefferson Martin Transmission Line project would likely occur within the same 12-month period during which the Skyline Boulevard Bridge is being reconstructed above the dam and thus would intensify the magnitude of construction activities. The CSSA Transmission Upgrade project construction is scheduled to occur from 2010 to 2013 and would overlap with the LCSDI project at both the top and toe of the dam, also prolonging and exacerbating the construction disruption in these locations. Construction activities for the LCSDI and CSSA Transmission Upgrade projects together would also expand the area of disruption in both locations. At the top of the dam, the CSSA Transmission Upgrade project would include upgrade and repair of the outlet structures, requiring work in the vista point area as well as require extensive construction activities from barges in the reservoir directly adjacent to LCSD. At the toe of the dam, construction activities associated with the CSSA Transmission Upgrade project would include replacing the Crystal Springs Pump Station as well as improving the CSSA pipeline and the outfall structures discharging to San Mateo Creek. The CSPL2 Replacement project would occur in the vicinity of Staging Areas 1, 2, and 3, also intensifying and/or prolonging the construction disruption at the toe of the dam.

One cumulative effect of these multiple projects in the same location is that implementation of site restoration and revegetation plans would be delayed. However, concurrent construction of multiple SFPUC projects would also result in certain efficiencies that could reduce some of the construction disruption, such as the use of spoils from the LCSDI project as fill material for the CSSA Transmission Upgrade project, and possibly fewer construction workers at the same location over a longer duration than if the projects were constructed at different times. Furthermore, the cumulative impacts on visual resources due to the extended and amplified construction activities would be temporary; there would be limited and/or restricted public access to some of the visual resources during the construction period, and similar views of the reservoir and watershed would remain available nearby along Skyline Boulevard. For these reasons, and because the project's construction period would last a maximum of 14 months, the LCSDI project's contribution to the cumulative construction impact on visual resources would not be cumulatively considerable (*less than significant*). Furthermore, implementation of Mitigation Measure M-TR-1 (Traffic Control Plan) described in Section 5.6, Transportation and Circulation, would require that informational signs be posted at key locations to alert the public of the short-term construction activities occurring under the proposed project and to inform them of detours and alternate routes.

Construction Projects in the Sampling Station #5 Vicinity

The LCSDI project could overlap with construction of three projects in the vicinity of Sampling Station #5, including the Pulgas Discharge Channel Modifications project, the Pulgas Structural Rehabilitation and Roof Replacement project, and the Pulgas Modification of Existing Dechloramination Facility project. However, since existing vegetation and trees screen views of the Sampling Station #5 site and construction activities would not be visible from any publicly accessible locations, there would be no cumulative aesthetics impact at this site (*not applicable).*

Long-Term Cumulative Impacts

The long-term cumulative impact on visual resources associated with operation of the projects listed in Table 5.1-1 would generally be beneficial. The existing PG&E Jefferson-Martin Transmission Line would be installed within the roadway of the reconstructed Skyline Boulevard Bridge, removing the massive towers and overhead lines adjacent to the LCSD and improving the panoramic views of the reservoir and the watershed from numerous viewpoints. The CSSA Transmission Upgrade project would replace the outlet structures adjacent to the LCSD with underwater structures and remove the walkways leading to them, thereby expanding the continuous views of the reservoir and improving the visual quality at the vista point. The Habitat Reserve Program (HRP) would include various habitat improvement projects throughout the Peninsula watershed. Although these improvements would alter the visual setting, the overall change would not result in adverse effects on scenic resources or the overall visual character of the watershed.

The modifications to the LCSD, in combination with San Mateo's proposed design of the new Skyline Boulevard Bridge, would together result in permanent visual changes to the dam and bridge and affect views from key observation points; this would be a potentially cumulative adverse impact on visual resources. However, as described and analyzed above under Impact AE-3, the combined effects would not substantially alter views of the dam and would not affect the predominant views of the Crystal Springs Reservoir and the watershed from public viewing areas. Thus, the project's contribution to the long term, cumulative impact on visual resources would be less than cumulatively considerable and therefore the impact would be *less than significant*. Furthermore, implementation of Mitigation Measure M-AE-1 (Landscaping Plans) would ensure that the staging and construction areas disrupted by the LCSDI project would be restored to preconstruction conditions.

As described above under Impact AE-4, the project would result in potentially significant and unavoidable visual effects due to the inundation of shoreline woodlands, but with implementation of Mitigation Measure M-AE-4 (Tree Removal Plan) where feasible, the long-term appearance of the reservoir and watershed would be comparable to the existing conditions. The long-term condition would consist of a different mix of grassland, wetland, and woodland vegetation, as the vegetation and habitat types gradually adjust to the changes in inundation frequency and reservoir operating levels, but the overall views of the reservoir and watershed would be similar to existing conditions, assuming removal of dead trees along the shoreline. However, none of the other past, present and reasonably foreseeable projects in the Crystal Springs Reservoir vicinity would contribute to the long term visual appearance of the reservoir's shoreline, and therefore, there would be no cumulative impact.

5.3.4 References

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City and County of San Francisco (CCSF), *Scenic Easement* and *Scenic and Recreation Easement granted to the United States Department of Interior* [over portions of Crystal Springs Reservoir watershed properties], January 14, 1969.

Eide, Jeremy, San Mateo County Agricultural Commission, telephone conversation with A. Chan, ESA+Orion, November 7, 2009.

Federal Register 72, Number 38, 8585-8601, *Phytophthora Ramorum*; Quarantine and Regulations, February 27, 2007.

San Francisco Public Utilities Commission (SFPUC), *Peninsula Watershed Management Plan*, 2002.

San Mateo County, Department of Environmental Management, Planning and Development Division, *San Mateo County General Plan*, 1986.

5.4 Population and Housing

This section discusses the potential for project-specific aspects of the proposed Lower Crystal Springs Dam Improvements (LCSDI) project to induce substantial population growth, displace housing, create a substantial demand for additional housing in the project area, or necessitate the construction of housing outside the project area. The growth-inducement effects of the LCSDI project within the context of the SFPUC's Water System Improvement Program (WSIP) and the overall regional water system as well as the indirect effects of that growth are analyzed in the Program EIR (PEIR) on the WSIP, which is incorporated into this EIR by reference (San Francisco Planning Department, 2008), and summarized in Chapter 1, Section 1.2.2, SFPUC Water System Improvement Program, and in Chapter 7, Section 7.1, Growth-Inducing Impacts, of this EIR.

5.4.1 Setting

The proposed project is located in unincorporated San Mateo County entirely within SFPUC Peninsula watershed lands, which encompasses 23,000 acres of open space lands that are used primarily for water collection, transmission, and storage. Except for SFPUC water supply facilities, groundskeepers' cottages, and ancillary structures, the Peninsula watershed is largely undeveloped.

Existing land uses in the project vicinity include a mix of recreational, residential, and educational/club facilities. Interstate 280 (I-280) extends in a north-to-south direction along the eastern edge of the Peninsula watershed, and land use in the unincorporated areas of San Mateo County west of I-280, including the project area, is dominated by open space. The majority of urban and suburban development in San Mateo County is located east of I-280. (See Section 5.2, Land Use, for additional information regarding land uses in the project vicinity.)

In the year 2009, San Mateo County was home to approximately 745,858 residents and had approximately 260,578 housing units (State of California, Department of Finance, 2009). Between 2000 and 2009, the total population of San Mateo County increased by approximately 5.5 percent, and the total number of housing units increased by approximately 3.2 percent.

5.4.2 Regulatory Framework

There are no federal, state, or local regulations governing population and housing that apply to the LCSDI project.

5.4.3 Impacts and Mitigation Measures

5.4.3.1 Significance Criteria

The City and County of San Francisco has not formally adopted significance standards for impacts related to population and housing, but generally considers that implementation of the proposed project would have a significant impact if it were to:

- Induce substantial population growth in an area, either directly or indirectly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure);
- Displace substantial numbers of existing housing units or create demand for additional housing, necessitating the construction of replacement housing; or
- Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere.

Due to the nature of the proposed project, there would be no impacts related to the following criteria; therefore, no impact discussion is provided for these topics for the reasons described below:

> *Induce substantial population growth in an area, either directly or indirectly*. During the proposed 14-month construction period, between 22 and 55 construction workers would be employed as part of the proposed project, including construction at both the Lower Crystal Springs Dam and Sampling Station #5 sites (see Chapter 3, Section 3.6.2.3, Workforce and Equipment). It is expected that the construction workforce requirements could be met with the local labor force within the Bay Area. While some workers might temporarily relocate from other areas, the increase would be minor (fewer than 55 workers) and temporary (up to 14 months). Long-term operation and maintenance of the dam and Crystal Springs Reservoir would be conducted by the existing SFPUC workforce and would not require any additional personnel. The proposed project does not include any proposal to construct new homes or businesses in the area, or extend new roads or other infrastructure into undeveloped areas. Therefore, construction and operational activities associated with the proposed project would not result in a substantial increase in the local population, and there would be no growth-inducement impact due to project-specific considerations.
>
> The LCSDI project, as a facility improvement project in the WSIP, would be a contributing factor in the growth-inducement potential of the overall WSIP. Growth inducement of the proposed project within the context of the WSIP and the regional water system is discussed in Chapter 7, Section 7.1, Growth-Inducing Impacts. Indirect effects of the project on population and housing growth, due to growth inducement potential, and secondary effects of growth are discussed in Chapter 7, Section 7.1.4, Indirect Effects of Growth.
>
> *Displace Substantial Numbers of Housing Units or Create Demand for Additional Housing*. The proposed project would improve existing water supply infrastructure and would not displace any existing housing units. Between 22 and 55 construction workers would be employed as part of the proposed project (see Chapter 3, Section 3.6.2.3, Workforce and Equipment), but it is expected that the construction workforce requirements could be met by the local labor force within the Bay Area and would not create demand for additional housing. Therefore, impacts related to the displacement of housing necessitating the construction of replacement housing are not applicable.
>
> *Displace Substantial Numbers of People*. The proposed project would improve existing water supply infrastructure, and the project's construction or operational activities would not displace housing units or people or necessitate the construction of replacement housing elsewhere. Therefore, this impact criterion is not applicable.

5.4.3.2 Impacts

As described above, there would be no additional growth-inducement impact due to project-specific considerations, and implementation of the proposed project would not result in impacts related to housing. Therefore, there are *no impacts* under this topic.

5.4.3.3 Mitigation Measures

None required for project-specific effects on growth inducement and housing. (Please refer to Chapter 7 and Appendix E of the WSIP PEIR, which are incorporated into this EIR by reference, for discussion of mitigation measures for growth inducement and indirect impacts of growth associated with the WSIP.)

5.4.3.4 Cumulative Impacts

Because the project would not result in any project-specific impacts related to growth inducement and housing, implementation of the proposed project would not result in cumulative impacts beyond the secondary and indirect impacts of growth associated with the proposed project within the context of the WSIP, as described in Chapter 7, Section 7.1, Growth-Inducing Impacts, of this EIR.

5.4.4 References

San Francisco Planning Department, *Final Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program,* File No. 2005.0159E, State Clearinghouse No. 2005092026. Certified October 30, 2008.

State of California, Department of Finance, California County Population Estimates and Components of Change by Year, July 1, 2000–2009. Sacramento, California, December 2009.

5.5 Cultural and Paleontological Resources

Cultural resources include historic architectural resources, archaeological resources, paleontological resources,[1] and human remains. This section provides an assessment of potential impacts on cultural resources that might be present in the vicinity of the Lower Crystal Springs Dam Improvements project (LCSDI or proposed project). Mitigation measures to reduce impacts to a less-than-significant level are identified, where feasible.

5.5.1 Setting

5.5.1.1 CEQA Area of Potential Effects

For the purpose of environmental review under the California Environmental Quality Act (CEQA), the definition of the CEQA Area of Potential Effects (C-APE) is modeled after that of the federal Area of Potential Effects (APE) described in the Code of Federal Regulations (36 CFR 800.16[d]).

> The C-APE is the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historical resources (i.e., California Register–eligible resources), if any such properties exist. The C-APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking. [San Francisco Planning Department, 2008]

As described in Chapter 3, Project Description, implementation of the proposed project is subject to a Clean Water Act, Section 404 permit from the U.S. Army Corps of Engineers, and under this permit the project is also required to comply with federal environmental laws, including Section 106 of the National Historic Preservation Act, as amended. It is anticipated that the C-APE will be identical to the federal APE.

The C-APE for the proposed project includes areas that would be affected by construction activities associated with the dam improvements and raising of Sampling Station #5, as well as areas affected by proposed operations, including the entire shoreline of Crystal Springs Reservoir (Upper and Lower), which would be subject to inundation under post-project conditions. Currently, the California Department of Water Resources, Division of Safety of Dams (DSOD) restricts the maximum reservoir water level to 283.8 feet. The post-project normal maximum water level would be 287.8 feet, although there would be occasional exceedances of this level for short durations, when the water surface elevation could be as high as 291.8 feet. Thus, the increased operational level of the reservoir could affect the area along the shoreline between 283.8 and 291.8 feet. For this analysis, the C-APE includes Lower Crystal Springs Dam (LCSD), the construction and staging areas at the top and toe the dam, the shoreline band around Crystal Springs Reservoir (from the current DSOD-permitted water level of 283.8 feet to the post-project maximum water level of 291.8 feet), plus a 50-foot buffer around the reservoir (which also encompasses the Sampling Station #5 construction area).

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[1] Paleontology is the science of the forms of life existing in prehistoric times, as represented by fossilized animals and plants.

5.5.1.2 Environmental Setting

Upper and Lower Crystal Springs Reservoirs occupy a valley in the San Andreas Rift Zone of the Coast Ranges between Sawyer and Cahill Ridges on the west and Buri Buri and Pulgas Ridges on the east. San Mateo and Laguna Creeks flowed along the valley floor prior to construction of the reservoirs. These creeks have since been inundated by Upper and Lower Crystal Springs Reservoirs.

In general, vegetation in the C-APE is dominated by mixed hardwood forest, oak woodland, and chaparral (coastal scrub) on the western side, and oak woodland and non-native annual grassland (historically used for agriculture) on the moderate slopes of the east side. The southern end of Upper Crystal Springs Reservoir is dominated by mixed willow forest, while the reservoir margins and inlets are vegetated by freshwater marsh and seasonal wetlands.

5.5.1.3 Archaeological/Prehistoric Setting

Prehistoric Context

Categorizing prehistoric times into broad cultural stages allows researchers to describe a wide number of archaeological sites with similar cultural patterns and components during a given period of time, thereby creating a regional chronology. This section provides a brief discussion of the chronology for the C-APE.

A framework for the interpretation of the San Francisco Bay Area, including San Mateo County, is provided by Milliken et al. (2007), who have divided prehistoric California into three broad periods: the Early Period, the Middle Period, and the Late Period. Economic patterns, stylistic aspects, and regional phases further subdivide cultural patterns into shorter phases. This scheme uses economic and technological types, socio-politics, trade networks, population density, and variations of artifact types to differentiate between cultural periods.

The Paleoindian Period (11,500 to 8000 B.C.) was characterized by big-game hunters that occupied broad geographic areas; evidence for this period has not yet been discovered in the San Francisco Bay region. The Early Period, consisting of the Early Holocene (8000 to 3500 B.C.) and Early Period (3500 to 500 B.C.), was evidenced by continued geographic mobility and the use of millingslabs, handstones, as well as large, wide-stemmed and leaf-shaped projectile points. Cut shell beads and the mortar and pestle were first documented in burials during this period, indicating the beginning of a shift to sedentism.[2] During the Middle Period, which includes the Lower Middle Period (500 B.C. to A.D. 430) and Upper Middle Period (A.D. 430 to 1050), geographic mobility may have continued, although groups began to establish longer-term base camps in localities from which a more diverse range of resources could be exploited. The first rich black middens were recorded from this period. The addition of milling tools and obsidian and chert concave-base points as well as the occurrence of sites in a wider range of environments suggest that the economic base was more diverse. By the Upper Middle Period, mobility was being replaced by the development of numerous small villages. Around A.D. 430, a "dramatic cultural disruption" is evidenced by the sudden collapse of the shell-bead trade network. During the Initial Late Period (A.D. 1050 to 1550), social complexity developed around the habitation of large, central villages with resident political leaders and specialized activity sites. Artifacts associated with the period include the bow and arrow, small corner-notched points, and a diversity of beads and ornaments.

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[2] The transition from nomadic to permanent, year-round settlement.

Ethnographic Context

The C-APE is within the traditional territory of the Costanoan people, also referred to as Ohlone, Mutsun, and Rumsun (Levy, 1978:485–495). These people, collectively referred to by ethnographers as Costanoan, were actually distinct sociopolitical groups that spoke at least eight languages of the same Penutian language group. The Costanoan occupied a large territory from San Francisco Bay in the north to the Big Sur and Salinas Rivers in the south. The primary sociopolitical unit was the tribelet, or village community, which was overseen by one or more chiefs. The C-APE is in the greater *Ramaytush* language area (Levy, 1978:485).

Economically, the Costanoan engaged in hunting and gathering. Their territory encompassed both coastal and open valley environments that contained a wide variety of resources, including grass seeds, acorns, bulbs and tubers, bear, deer, elk, antelope, a variety of bird species, marine resources, and small mammals. The Costanoan acknowledged private ownership of goods and songs, and village ownership of rights to land and/or natural resources; they appear to have aggressively protected their village territories, requiring monetary payment for access rights in the form of clamshell beads, and even shooting trespassers if caught. After European contact, Costanoan society was severely disrupted by missionization, disease, and displacement.

5.5.1.4 Historic-Period Setting

In historic times, the valley that now holds Crystal Springs Reservoir experienced a rapid transition from wilderness used by local Indian tribes, to ranching and agriculture, and then to use as a municipal water storage facility. The following historic-period setting is summarized from the *Historic and Archaeological Resources Inventory Report* prepared for this project (ENTRIX/MSE JV, 2009). This report is provided in **Appendix F**.

Land Grants in the Mexican Period (1822–1848)

In the wake of Mexican independence in 1822, the government began issuing large land grants on former Mission lands in many parts of California. The process accelerated after 1833, when the former mission lands were secularized and seized by the government. The vicinity of the C-APE forms the intersection between five such grants: Ranchos Feliz and Cañada Raymundo to the west, and Ranchos San Mateo, Buri Buri, and Las Pulgas to the east.

Rancho de las Pulgas was the largest and oldest of these, granted in 1795. The 35,000-acre rancho stretched from the bay estuary to the Crystal Springs Reservoir Valley and from San Mateo Creek in the north to the Santa Clara county line in the south. The other ranchos in the area were granted in the 1840s. The 6,000-acre Rancho San Mateo, in the northwest portion of the project area, had previously been held in reserve by the government as a potential zone for resettlement of Native Americans. Rancho Cañada Raymundo, which extended to the southwest portion of the C-APE, was granted in 1840 to John Coppinger, one of the earliest Anglo immigrants to the San Francisco Peninsula. Rancho Cañada Raymundo was known for its rich timber resources and was an early center of logging and milling on the Peninsula. Rancho Feliz, located to the north of Cañada Raymundo, was granted in 1844 to Domingo Feliz. Feliz' 4,400-acre holding was used for ranching and farming, and the site of his adobe lies along the western shore of Upper Crystal Springs Reservoir, within the C-APE for this project.

The Early American Period (1849–1870s)

The Gold Rush of 1849 brought thousands of Anglo-American immigrants into the Bay Area. Many who did not find success in the gold fields decided to appropriate what they saw as empty land on ranchos around the bay. On Rancho de las Pulgas, for instance, at least 23 squatters were occupying land in 1853.

Mexican landowners were faced with a new legal system that took an average of 17 years to resolve claims. During the long legal process, many landowners were forced to sell off portions of their land to pay legal fees. Apparently, the only Mexican landowner to retain property in the C-APE was Domingo Feliz, who continued living at his adobe until at least 1859, though on a much-reduced parcel of only 270 acres (Babal, 1990:57).

From the 1850s to 1887, when construction of the LCSD began, the Crystal Springs Valley and its surroundings contained a community of farmers, loggers, and tradesmen, as well as the summer homes of wealthy urbanites. Land use in the C-APE and vicinity during the 1850s and 1860s was characterized by logging on the surrounding hills, and farming, transportation, and recreation in the valleys.

With regard to transportation, the Crystal Springs Valley had a number of early roads that bisected the area. By the mid-1850s, the predecessor to Highway 92 was graded through the valley between Burlingame and Half Moon Bay. The portion of the road from San Mateo to Crystal Springs Valley climbed up San Mateo Creek and was completed in 1860. This road intersected a local route that passed north-south through the valley. By 1865, the San Mateo, Pescadero, and Santa Cruz Stage Company provided daily stagecoach service, which stopped at Crystal Springs, San Feliz Station, and Byrnes' Store, all within or near the C-APE.

The rustic setting of the Crystal Springs Valley, land of country homes and profitable ranches, was short lived. By the mid-1860s, the Spring Valley Water Company had begun to acquire land on a large scale, a development that would soon replace the residential character of the valley with large reservoirs (see discussion below).

Spring Valley Water Company

As the population of San Francisco grew, reliable water supply to the arid city became an important concern. In 1858, a group of San Francisco businessmen formed the Spring Valley Water Company and quickly absorbed their competitors. To solve the water supply problem, Spring Valley Water Company began acquiring land to build reservoirs in the steep valleys of northern San Mateo County, and implemented a program of almost continuous dam building in the area that lasted into the 1890s.

Spring Valley Water Company was aware of Crystal Springs Valley's potential as a reservoir site as early as the 1860s, when the company purchased the Crystal Springs Hotel to secure its land and the water rights to San Mateo Creek.

By the mid-1870s, the company had acquired enough land to begin construction of the Upper Crystal Springs Dam (UCSD), which was known as "Laguna Dam" in the local press at the time. Designed by Hermann Schussler, the German engineer who also supervised construction of earlier dams for Spring Valley, the UCSD was 70 feet high and 520 feet wide when completed in 1876. It stretched across the valley along the current alignment of Highway 92, near the site of Byrnes' Store.

Continuing growth in San Francisco's demand for water led engineer Schussler to design a second dam in the valley, this one to stretch across San Mateo Creek at the point where it turned east and flowed down out of the Crystal Springs/San Andreas Valley. The LCSD was architecturally innovative and marked a high point in Schussler's career. At 145 feet in height when completed, the LCSD was the largest concrete dam in the United States at the time (Shoup, 1989; see also Mermel, 1963).

Work commenced in summer 1886, as teams of men and horses cleared the site and identified bedrock anchors for the dam. Construction began in 1887 with over 100 men, a workforce that would grow to almost 1,000 over the course of the project. Men cut a 6-foot foundation trench into bedrock with hand tools, worried that using explosives would weaken the surrounding stone. Schussler devised an innovative system of interlocking concrete blocks to ensure the strength of the dam. Concrete was mixed in six steam-powered mixers set on a three-story platform above the dam, then carried by hand to pipes that were used to fill wooden forms. The resulting blocks were alternately set and had irregular projections on their sides which locked them into the adjacent blocks, jigsaw-fashion. The resulting dam surface had no continuous seams that might form a weak point in the concrete (Shoup, 1989).

The LCSD reached a height of 115 feet in 1888 and was raised to its final height of 145 feet by 1890. When completed, the dam impounded 22 billion gallons of water over 1,483 acres. The outlet tunnel of the dam was fed by three feeder tunnels (also know as adits) at different depths and was set low in the hill to allow water to be drawn even in dry years. The water was pumped to San Francisco via a 44-inch-diameter pipeline that followed the bay shore (Shoup, 1989; Babal, 1990:95). On its completion, the LCSD made the UCSD and its system of pumping water up to the Pilarcitos pipeline obsolete.

Since the new dam flooded the San Mateo–Half Moon Bay highway that had passed through Crystal Springs Valley, the level of the UCSD was later raised by 20 feet to serve as a replacement bed for the county road. Highway 92 currently transects Upper and Lower Crystal Springs Reservoirs at the UCSD. A number of cottages for Spring Valley Water Company employees were also constructed in the 1880s and 1890s, including Lower Crystal Springs Cottage (constructed in 1898), just north of the LCSD, Upper Crystal Springs Cottage (constructed in 1886), west of the UCSD, and the South Crystal Springs Cottage (constructed in 1891), on the east shore of Upper Crystal Springs Reservoir. Of these, only the South Crystal Springs Cottage is in the C-APE. The others were replaced in the 1950s, and these newer facilities are of outside the C-APE.

The C-APE since 1930

In 1930, the City and County of San Francisco (CCSF) purchased Spring Valley Water Company's watershed lands and soon placed them under the administration of the newly formed San Francisco Water Department. Crystal Springs Reservoir was selected to be the terminus of the pipeline system that brought water from the Sierra Nevada across the Central Valley and under San Francisco Bay. The first Hetch Hetchy water began flowing into Crystal Springs Reservoir on October 24, 1934 (Babal, 1990:42). To memorialize the event, a classically inspired temple was constructed in 1938. The Pulgas Water Temple is 60 feet high and 25 feet in diameter and the stands above a weir that was the original terminus of the Hetch Hetchy Aqueduct. Hetch Hetchy water can flow either directly to San Francisco or to Crystal Springs Reservoir. The water going to Crystal Springs Reservoir is currently conveyed through the Pulgas Dechloramination Facility rather than through the channel beneath the Pulgas Water Temple.

Since 1938, the lands covered by the C-APE have been operated by the SFPUC as a reservoir site and surrounding watershed. Only minor changes in land use have occurred within the C-APE, predominantly associated with the SFPUC's management and operation of its water facilities. Replacements for the original North, Lower, and Upper Crystal Springs Cottages were built between 1954 and 1959; these facilities are all outside of the C-APE.

Since the 1940s, interior and eastern San Mateo County has been transformed from a rural and agricultural region to a series of urban/suburban communities. The C-APE is located within the SFPUC's Peninsula watershed, which forms the largest open space area for the communities along the San Francisco Peninsula. The C-APE is also at the nexus of two major transportation corridors: Highway 92 has become a major route for commuters from the coastal communities, while Interstate 280 forms one of the most important north-south transportation routes between San Francisco and the South Bay.

5.5.1.5 Research Methods

The principal source of information for this analysis is the *Historic and Archaeological Resource Inventory Report for the Lower Crystal Springs Dam Improvements Project* (ENTRIX/MSE JV, 2009) and is included as Appendix F to this EIR. This report presents the results of extensive historic and archaeological surveys, together with the methods used and level of effort expended. In all cases, surveyors possessed the appropriate permits and qualifications and operated according to accepted professional practice and agency protocols.

A records search was undertaken on behalf of ENTRIX/MSE JV by staff at the Northwest Information Center (NWIC) of the California Historical Resources Information System at Sonoma State University on February 23, 2006. The database was searched for historic and archaeological sites and studies within a 1.25-mile radius of the C-APE. In addition to reviewing site records and study reports, the search consisted of a review of the following:

- National Register of Historic Places, Directory of Determinations of Eligibility, California (NPS, 1988)
- Historic Properties Directory for San Mateo County (OHP, 2008)
- California Register of Historical Resources (OHP, 2002)
- California Historical Landmarks (OHP, 1996)
- California Points of Historical Interest (OHP, 1992)
- California Inventory of Historical Resources (OHP, 1976)
- SFPUC Peninsula Watershed Management Plan and EIR

ENTRIX/MSE JV undertook research for the LCSD and UCSD at the following locations:

- Bancroft, Map, Periodicals and Water Resources Libraries, University of California, Berkeley
- California State Archives and California State Library, Sacramento
- San Mateo County Historical Association Library, Redwood City

Research for the proposed project also included review of other SFPUC reports prepared in support of various Water System Improvement Program (WSIP) facility improvement projects that are located within the C-APE. These include the following:

- Final Crystal Springs/San Andreas Transmission Upgrade Project Archaeological Survey and Architectural Inventory and Evaluation Report for CEQA Compliance (Jones and Stokes, September 2009)

- Final Historic Resources Inventory for the San Francisco Public Utilities Commission Crystal Springs Pipeline No. 2 Replacement Project (Circa Historic Property Development, March 2009)

- Historic Resources Study for the Pulgas Discharge Channel Improvements Project (Carey & Co., 2007).

Historic Architectural Resources Recorded in the C-APE

The records search identified one historic cultural resource, the LCSD, within the C-APE. In addition, evaluations of three other historic architectural resources have been conducted in the C-APE. In 2009, Crystal Springs Outlet Structures 1 and 2 were evaluated for their historical significance as part of the SFPUC's Crystal Springs/ San Andreas Transmission Upgrade project (Jones & Stokes, 2009). In 1989, as part of a planned bridge replacement project, the San Mateo County Department of Public Works commissioned a study of the LCSD and Skyline Boulevard Bridge. The results of these evaluations are summarized in **Table 5.5-1** and described below.

TABLE 5.5-1
HISTORIC ARCHITECTURAL RESOURCES EVALUATED IN THE C-APE

Name	Eligibility Status	CEQA Historical Resource (yes/no)
Lower Crystal Springs Dam	Eligible	Yes
Crystal Springs Outlet Structure 1	Eligible	Yes
Crystal Springs Outlet Structure 2	Ineligible	No
Skyline Boulevard Bridge	Ineligible	No

Lower Crystal Springs Dam

The LCSD is important for its engineering and technological contributions to history. It involved innovative techniques for building large concrete dams and was the highest concrete dam with the largest gross capacity in California for two decades following its completion. In 1976, the American Society of Civil Engineers recognized it as a California Historic Civil Engineering Landmark. This dam is eligible for the National Register of Historic Places (NRHP) under Criterion A (Event) and Criterion C (Design/Construction) of the NRHP Criteria for Evaluation. The event in this case was a pattern of events—the series of technological innovations that allowed large water storage dams to be erected to encourage the expansion of urban areas. The dam is also eligible for the NRHP under the design/construction criterion, since the dam's form, structure, plan, and materials embody the distinctive characteristics of a type, period, and method of construction. This was the work of a master, Hermann Schussler. The LCSD illustrates the pattern of features common to its class of resources, the individuality that occurs within the class, and, when compared to other dams, the evolution of that class. It is an important and significant example of building practices of a particular historical period. The LCSD was a key turning point in establishing a trend away from gravity dams built of rock and concrete toward all-concrete dams. The complex, irregular shapes of the concrete blocks used to create the dam were relatively unique and did not become general construction practice. Schussler developed a number of innovative construction techniques for the LCSD that included washing the aggregate, machine-mixing the concrete, roughening the existing surfaces to ensure adhesion, curing the concrete by covering and wetting, and staggering the joints between the concrete block. Only one other dam, the Searsville Dam now owned by Stanford University, is known to have been built in this way. This latter dam was also designed by Schussler and was constructed at the same time as the LCSD.

Character-defining features of the LCSD include the irregular, concrete block construction in a large, gravity-driven, curved concrete dam built for water supply purposes during the 1880s, with a relatively narrow spillway located at the top of the dam. The Crystal Springs Outlet Structure 1 is also considered a character-defining feature of the dam (see discussion below).

The LCSD has been determined eligible for listing in the NRHP under Criteria A and C through a consensus between the State Historic Preservation Officer and the Federal Highways Administration (Shoup, 1989). As a resource that has been formally determined eligible for listing in the NRHP, the LCSD is considered eligible for listing in the California Register of Historical Resources (CRHR) under Criteria 1 and 3. As stated above, the American Society of Civil Engineers listed the LCSD as a California Historic Civil Engineering Landmark in 1976. Finally, the LCSD is listed in the California Inventory of Historical Resources. As such, the LCSD is considered a historic resource for the purposes of CEQA.

Crystal Springs Outlet Structures 1 and 2

The Crystal Springs Outlet Structures 1 and 2 (OS-1 and OS-2), located immediately north of the dam, were completed in 1889 and 1937, respectively. Jones & Stokes evaluated both structures for their historical significance in 2009 as part of the SFPUC's Crystal Springs/ San Andreas Transmission Upgrade (CSSA) project (see Chapter 3, Section 3.8, and Chapter 5, Section 5.1.4, for further description of this project). The Jones & Stokes evaluation noted that OS-1 appears eligible for listing in the NRHP under Criterion C as a contributor to the LCSD, while OS-2 does not (Jones & Stokes, 2009).

The Jones & Stokes evaluation of the OS-1 noted that, "It is likely that at the time of its construction, no other outlet structure built separately from a dam allowed for equivalent control of the drawing of water from a reservoir within as wide a range of surface level variance. Moreover, the Crystal Springs Outlet Structure 1 was praised in engineering circles for its design, which allowed all of its pipe and gate facilities to be accessed by maintenance workers from its interior. It appears to have become the model of outlet works of its dam-independent and multi-level type. Although some nineteenth-century outlet works built into dam structures did provide for multi-level water draw and offered ample maintenance accessibility, many made recourse to pipes imbedded in concrete. In general, many outlet features of the era required maintenance from water bound divers. No other nineteenth-century outlet structure besides the Crystal Springs Outlet Structure 1—let alone any outlet structure built for urban water distribution during the nineteenth century—provided an equivalent combination of multi-level water draw range and maintenance accessibility. Moreover, no other nineteenth-century outlet structure design provided this combination of multi-level range and maintenance accessibility while allowing the dam structure necessitating its construction to be designed and built for maximum possible strength" (Jones & Stokes, 2009).

The Jones & Stokes evaluation of the OS-2 noted that, "The Crystal Springs Outlet Structure 2 does not appear to meet the criteria for listing in the CRHR. [The San Francisco Water Department] constructed this outlet during the 1930s. Its period of significance is 1931–1937, during which the City of San Francisco acquired the properties of the Spring Valley Water Company, completed the Hetch Hetchy project, and integrated the two systems in ways that involved construction of new facilities in the area of the LCSD. The project to construct Outlet Structure 2 was funded in part by the Public Works Administration under the National Recovery Act. Numerous infrastructure projects in the Bay Area were funded by or constructed by workers employed by New Deal federal agencies during the Depression era. Overall, then, this resource is not notable for its association with water or infrastructure development in the Bay Area, state, or nation during the interwar years and therefore does not appear to meet CRHR Criterion 1. The outlet structure is also not known to be associated with a person who made significant contributions to local, state, or national history (CRHR Criterion 2). Nor is it known to be associated with a master water engineer. The multi-level adit and accessible tower design of the Crystal Springs Outlet Structure 2 was essentially derivative of the older Crystal Springs Outlet Structure 1. Outlet Structure 2 does not, therefore, appear to be eligible under CRHR Criterion 3. In summary, the Crystal Springs Outlet Structure 2 does not appear to meet the criteria for listing in the CRHR" (Jones & Stokes, 2009).

Skyline Boulevard Bridge (also known as Crystal Springs Dam Bridge)

The 1920s-era Skyline Boulevard Bridge crosses over and is supported by piers in the LCSD. This bridge has been determined not to be eligible for the NRHP for reasons described in the Initial Study and Mitigated Negative Declaration prepared by San Mateo County for the Crystal Springs Dam Bridge Replacement Project (San Mateo County, 2009b) and described in detail in the study, *Historic Property Survey Report for Lower Crystal Springs Dam and Skyline Boulevard Highway Bridge (#35C0043), San Mateo County, California* (Shoup, 1989). The preparers of this document concur with the San Mateo County finding that, "The bridge, built on top of the dam in 1924, is not associated with important events or significant people, nor can it yield information in history. The bridge is also a common bridge type, easy to construct, and in all ways unexceptional" (San Mateo County, 2009b).

Historic Architectural Survey and Results

The ENTRIX/MSE JV conducted an architectural survey from January 23 to 25, 2008 and again in September 2009 to document architectural/structural resources within the C-APE (ENTRIX/MSE JV, 2009). ENTRIX/MSE JV recorded and evaluated five potentially historic sites in the C-APE. These sites included the South Crystal Springs Cottage, the UCSD, and segments of three historic-era roads. Only one of these resources, the South Crystal Springs Cottage, was recommended as eligible for listing in the NRHP/CRHR and is considered a historic resource for CEQA purposes. The sites in the C-APE and their eligibility status are identified below in **Table 5.5-2**.

South Crystal Springs Cottage

The South Crystal Springs Cottage is one of a number of cottages built for Spring Valley Water Company employees at the time of the construction of the LCSD in the early 1890s. The construction of a number of cottages to house watershed keepers and other reservoir employees coincided with the LCSD's construction, as the new dam tripled the size of the reservoir and watershed lands of the UCSD, necessitating additional employees to maintain and/or patrol the expanded watershed. Since commuting from nearby communities was slow-going and more difficult in the late 19th century, cottages were conveniently constructed within the watershed to house employees and maintain an around-the-clock presence for Spring Valley Water Company. Although records differ, the Spring Valley Water Company built the cottage in either 1891 or

TABLE 5.5-2
HISTORIC ARCHITECTURAL SURVEY RESULTS

Name	Eligibility Status	CEQA Historical Resource (yes/no)
South Crystal Springs Cottage	Eligible	Yes
Upper Crystal Springs Dam	Ineligible	No
Pulgas Discharge Channel	Ineligible	No
1859 San Mateo–Crystal Springs Road	Ineligible	No
1883 San Mateo–Half Moon Bay Toll Road	Ineligible	No
1883 San Mateo–Half Moon Bay Toll Road	Ineligible	No

SOURCE: ENTRIX/MSE JV, 2009.

1896. The cottage consists of a single-story frame structure with a shingled gable roof measuring 44 feet by 62 feet. In 1901 the cottage was renovated, and two single-story wings were added: one measuring 19 feet by 30 feet and another 8 feet by 16 feet.

ENTRIX/MSE JV recommended the South Crystal Springs Cottage as eligible for listing in the NHRP and CRHR under Criterion A/1 (ENTRIX/MSE JV, 2009). This property is directly associated with the original construction of the Upper and Lower Crystal Springs Reservoirs, is the oldest of the extant reservoir keeper's cottages and structures built by the Spring Valley Water Company, and still functions in its original purpose. As a result, the South Crystal Springs Cottage is intimately tied to the Spring Valley Water Company's activities to bring water to the San Francisco Bay Area in the late 19th century through the early 20th century, and after 1930 when the Crystal Springs Reservoir and watershed came under the ownership of the SFPUC. Moreover, because the South Crystal Springs Cottage continues to be used in its original capacity, it retains its integrity of association both within the local cultural and physical environment and within the context of the cottage's original purpose. The South Crystal Springs Cottage also possesses integrity of location, design, setting, materials, workmanship, and feeling as an intact, watershed keeper's cottage. Accordingly, this property is associated with events that have made a significant contribution to the broad patterns of the local area's history and Spring Valley Water Company's management and use of the Crystal Springs Reservoir and watershed. The cottage also retains much of its original integrity and thus qualifies for listing in the NRHP and CRHR under Criterion A/1. Therefore, the South Crystal Springs Cottage is considered a historic resource for CEQA purposes.

The ancillary buildings to the South Crystal Springs Cottage—the outbuilding/residence/ garage, pump house, and storage shed—are not recommended for listing in the NRHP or CRHR. These structures played a secondary support role to the historic South Crystal Springs Cottage. While they are all 50 years of age and older, they constitute the type of vernacular structures typically found at larger residential and agricultural settings throughout the country. They are not architecturally distinctive and do not represent a method of construction that is extraordinary or unique. All three, especially the outbuilding/residence/garage, have suffered a loss of physical integrity due to incompatible additions and no longer function as they were originally intended. Therefore, none of the ancillary structures to the cottage are considered historic resources for CEQA purposes.

Upper Crystal Springs Dam

The UCSD was an earthfill dam constructed between 1875 and 1877 as part of Spring Valley Water Company's system of reservoirs serving San Francisco. The dam was raised to its final height of 83 feet in 1891; it currently serves as a causeway between the Upper and Lower Crystal Springs Reservoirs, with Highway 92 running atop the dam. The UCSD is considered ineligible for inclusion in the NRHP and CRHR. With sufficient integrity it might be eligible under Criteria A/1 and C/3 because of its association with events and persons significant in San Francisco Bay Area and California history; however, while the structure of the dam itself has changed little since its construction, the dam no longer serves its original function of water retention. The current use of the dam as a roadbed, the concealment of its dry (downstream) face by the waters of Lower Crystal Springs Reservoir, and the lack of a spillway make it difficult for the average observer to identify the structure as a dam or to associate it with the historical period of its construction. For these reasons, the UCSD does not have sufficient integrity of setting, feeling, association, workmanship, or materials to be an authentic example of its theme and to convey its significance as a historic dam, and is not a historic resource for CEQA purposes (ENTRIX/MSE JV, 2009).

Pulgas Discharge Channel

Beneath and adjacent to the historic Pulgas Water Temple site is the Pulgas Discharge Channel. While the Pulgas Water Temple is outside of the C-APE, the discharge channel is within the C-APE. The discharge channel is a rectangular-shaped, open channel that is approximately 800 feet long and 9 feet wide. It has 5-foot, 3-inch-tall reinforced-concrete walls that extend westward for approximately 400 feet, and 3-foot, 4-inch-tall walls that extend for the remaining length of the channel. The channel walls and slab are one monolithically poured structure without horizontal construction joints. The channel runs east-west and conveys water from the Pulgas Tunnel via the Dechloramination Facility to Upper Crystal Springs Reservoir. Initially known as an "outfall canal," the discharge channel was constructed by Grant Smith and Company in 1924 for the San Francisco Water Department.

Carey & Company evaluated the Pulgas Discharge Channel in 2007 as part of a historic resources study for the Pulgas Discharge Channel Improvements Project (Carey & Co., 2007). Carey & Company recommended the Pulgas Discharge Channel as ineligible for listing in the NRHP and CRHR due to its lack of historical significance. As such, the Pulgas Discharge Channel is not considered a historic resource for CEQA purposes.

1859 San Mateo to Crystal Springs Road

A segment of the 1859 San Mateo to Crystal Springs Road within the C-APE lies under the LCSD. The dam's utility buildings lie along the built-up asphalt road that follows the contours of the original road. The area has been heavily disturbed and built up to accommodate the dam, its construction, and the nearby facilities. No trace of the original road was discovered during the survey. The segment of the 1859 San Mateo to Crystal Springs Road within the C-APE is recommended as ineligible for inclusion in the NHRP and CRHR because, while it has some historical association, it retains little of its original integrity. As such, the 1859 San Mateo to Crystal Springs Road is not considered a historic resource for CEQA purposes. (ENTRIX/MSE JV, 2009)

1883 San Mateo to Half Moon Bay Toll Road and Culvert

Two segments of the 1883 San Mateo to Half Moon Bay Toll Road were encountered within the C-APE on the west and north margins of the reservoir. On the west side of the reservoir, the road trace trends northeast down a drainage and eventually disappears into the reservoir. In this location, the road consists of a level graveled bed approximately 20 feet wide. While generally clear of dense vegetation, the roadbed has become covered with grass and is beginning to show signs of decay. The road was also identified along the north end of the reservoir. The road crosses the northern end of Lower Crystal Springs Reservoir from the east along a low (10-foot) causeway. A portion of the road consists of a paved asphalt bed, while other portions are graveled and overgrown with vegetation. No historic artifacts were located along the road in either location. A single-gate concrete culvert about 14 feet long is located beneath the road along the western edge of the reservoir. Constructed between 1930 and 1940, the culvert controls the movement of water north-to-south between Lower Crystal Springs Reservoir to the south and Tracy Lake to the north. Atop the concrete culvert, a wooden superstructure/platform supports a wheel-controlled mechanism that regulates the flow of water through its chute or spillway.

The segments of the 1883 San Mateo to Half Moon Bay Toll Road within the C-APE appear ineligible for inclusion in the NHRP and CRHR because, although they have some historical association, they retain little historical integrity. The concrete culvert beneath a portion of the road was recommended as ineligible for inclusion in the NHRP and CRHR due to a lack of association with historic events or important people, and because it does not embody the distinctive characteristics of a type, period, or method of construction. As such, neither the 1883 San Mateo to Half Moon Bay Toll Road nor its associated culvert is considered a historic resource for CEQA purposes (ENTRIX/MSE JV, 2009).

1921 West Union to Byrnes' Store Road

A segment of the 1921 West Union to Byrnes' Store Road within the C-APE is located on the western shore of the reservoir, approximately 2,000 feet south of the LCSD. The roadbed is densely vegetated and consists of a shallow, lightly graveled linear depression approximately 20 feet wide that trends from the waters edge upslope to the west. An intensive survey of the roadbed failed to identify any other artifacts or architectural/engineering features. The segment of the 1921 West Union to Byrnes' Store Road within the C-APE appears ineligible for inclusion in the NHRP and CRHR because, while it has some historical association, it retains little of its original integrity. As such, the 1921 West Union to Byrnes' Store Road is not considered a historic resource for CEQA purposes (ENTRIX/MSE JV, 2009).

Archaeological Resources Recorded in the C-APE

The records search identified one prehistoric cultural resource, CA-SMA-126, within the C-APE. This site was recorded in 1970 as a small artifact concentration with associated midden. Artifacts mentioned on the site record were an *Olivella* spire-lopped bead and a possible mortar fragment.

CA-SMA-147 (Salzman, 1984) is recorded nearby but is outside of the C-APE. The site is an extensive shell midden with lithics, faunal remains, human-modified animal bones, other artifact types, and at least 14 human interments. Radiocarbon dating suggests the site was occupied year-round toward the end of the Middle Period (500 B.C. to A.D. 1050). The presence of this site indicates that the general area is sensitive for prehistoric archaeological resources.

Archaeological Field Survey Methods and Results

ENTRIX/MSE JV conducted an intensive cultural resources field survey of the C-APE from September 8 to September 23, 2006 (ENTRIX/MSE JV, 2009). The pedestrian survey consisted of 10-meter-wide transects walked parallel to the reservoir shoreline, from the current low-water mark (approximately 284 feet in elevation) to the anticipated post-project high-water mark (approximately 292 feet in elevation). On October 30, 2007, ENTRIX/MSE JV conducted an additional survey in the recorded location of the site in order to locate CA-SMA-126. The survey did not locate CA-SMA-126, and the surveyors did not identify any previously unrecorded prehistoric archaeological sites or isolated resources.

The results of the investigation indicate that this location appears to lack cultural material both in surface and subsurface contexts. No culturally deposited midden deposits were observed. The results of the survey indicate that CA-SMA-126 either no longer possesses an archaeologically discernible deposit or is inundated by the reservoir, or the previously documented location is outside of the C-APE.

Native American Consultation

Consultation with local Native American groups was initiated on February 7, 2006, with an inquiry letter sent to the Native American Heritage Commission (NAHC). The NAHC responded that its databases did not contain information regarding previously recorded Native American cultural or ritual sites within the C-APE. The NAHC provided a list of individuals with possible knowledge of or concerns about the C-APE. Letters were sent to the individuals on the list, but no responses have been received to date (Kremin, 2009).

Paleontological Setting and Assessment

Paleontological resources are the fossilized remains of plants and animals, including vertebrates (animals with backbones), invertebrates (e.g., starfish, clams, ammonites, and marine coral), and fossils of microscopic plants and animals (microfossils). The age and abundance of fossils depend on the location, topographic setting, and particular geologic formation in which they are found. Fossil discoveries not only provide a historic record of past plant and animal life, but may assist geologists in dating rock formations. In addition, fossil discoveries can constrain our understanding of the time periods and the geographic range of existing and extinct flora or fauna.

The LCSD, its spillway and stilling basin, as well as Sampling Station #5 on the Pulgas Discharge Channel are located in areas underlain by rocks of the Franciscan Complex and recent unconsolidated stream channel deposits, also referred to as Holocene alluvium (see Section 5.14, Geology and Soils, for a full description of the local geology). These rock units are briefly discussed below, although neither is considered fossil bearing (italicized symbols indicate how the units are shown in Section 5.14, Figure 5.14-1, Site Geology).

Fossils are rarely found in Franciscan bedrock (*fsr* and *fg*) due to its long history of shearing and deformation from tectonic processes. The Franciscan Complex originated as a package of deep-ocean sediments, making it improbable that any significant vertebrate fossils would be found in the unit. If other fossils were originally present in rock units of the Franciscan Complex, it is unlikely they would have been preserved because the units have since been altered under high heat and pressure, chaotically mixed, or severely fractured. Consequently, the fossil collections database at the University of California, Berkeley, Museum of Paleontology contain no records of fossils within the Franciscan Complex rocks in San Mateo County (UCMP, 2009), indicating that the rock unit has a low potential to yield paleontological resources.

Holocene alluvium in the project area includes active stream channels (*Qhsc*) and alluvial fan and fluvial deposits (*Qhaf*) of the San Mateo Creek drainage.[3] Information is not readily available on fossil resources within the area's Holocene deposits, but known fossil resources from the Holocene of the greater Bay Area are sparse and represent common taxa. The University of California Museum of Paleontology database contains few records from the Holocene of the greater Bay Area and primarily consists of invertebrate fossil and microfossil records (UCMP, 2009). Vertebrate fossils do not typically occur within Holocene alluvium because the deposits are too young and poorly consolidated to have preserved the vertebrate remains. As such, Holocene units are typically considered low-sensitivity in California unless known otherwise. The Holocene alluvium in the project area is thus evaluated as having a low paleontological potential to yield unique fossil resources.

5.5.2 Regulatory Framework

5.5.2.1 Federal Regulations

National Historic Preservation Act

Historic properties are protected through the National Historic Preservation Act of 1966, as amended (16 United States Code 470f), and its implementing regulations. Prior to implementing an "undertaking" (e.g., issuing a federal permit), Section 106 of the National Historic Preservation Act requires federal agencies to consider the effects of the undertaking on historic properties and to afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on any undertaking that would adversely affect properties listed or eligible for listing in the NRHP. Under the National Historic Preservation Act, an archaeological site or a historic building, structure, or object is considered significant if it meets the NRHP listing criteria at 36 CFR 60.4, as stated below:

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[3] An alluvial fan is a fan-shaped deposit of sand, silt, or mud formed at the point where a stream emerges from a ravine into a plain or other relatively flat area. Fluvial deposits include sediments deposited in a stream channel, along a stream bank, or on a floodplain.

> The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and:
>
> a) That are associated with events that have made a significant contribution to the broad patterns of our history, or
>
> b) That are associated with the lives of persons significant in our past, or
>
> c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction, or
>
> d) That have yielded, or may be likely to yield, information important in prehistory or history.

Federal review of projects is normally referred to as the Section 106 process. This process is the responsibility of the federal lead agency. The Section 106 review normally involves a four-step procedure, which is described in detail in the implementing regulations (36 CFR Part 800):

- Identify historic properties in consultation with the State Historic Preservation Officer and interested parties;
- Assess the effects of the undertaking on historic properties;
- Consult with the State Historic Preservation Officer, other agencies, and interested parties to develop an agreement that addresses the treatment of historic properties and notify the Advisory Council on Historic Preservation; and finally,
- Proceed with the project according to the conditions of the agreement.

5.5.2.2 State Regulations

The State of California implements the National Historic Preservation Act through its statewide comprehensive cultural resource surveys and preservation programs. The California Office of Historic Preservation (OHP), as an office of the California Department of Parks and Recreation, implements the policies of the National Historic Preservation Act on a statewide level. The OHP also maintains the California Historical Resources Inventory. The State Historic Preservation Officer is an appointed official who implements historic preservation programs within the state's jurisdictions.

California Environmental Quality Act

CEQA, as codified in California Public Resources Code (PRC) Section 21000 et seq., is the principal statute governing the environmental review of projects in the state. The CEQA Guidelines define a historic resource as: (1) a resource in the CRHR; (2) a resource included in a local register of historic resources, as defined in PRC Section 5020.1(k) or identified as significant in a historic resource survey meeting the requirements of PRC Section 5024.1(g); or (3) any object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California, provided the lead agency's determination is supported by substantial evidence in light of the whole record.

The CRHR is "an authoritative listing and guide to be used by state and local agencies, private groups, and citizens in identifying the existing historic resources of the state and to indicate which resources deserve to be protected, to the extent prudent and feasible, from substantial adverse change" (PRC Section 5024.1[a]). The criteria for eligibility to the CRHR are based on NRHP criteria (PRC Section 5024.1[b]). Certain resources are determined by the statute to be automatically eligible for inclusion in the CRHR, including California properties formally eligible for or listed in the NRHP.

To be eligible for the CRHR as a historic resource, a prehistoric or historic-period resource must be significant at the local, state, and/or federal level under one or more of the following criteria:

1) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;

2) Is associated with the lives of persons important in our past;

3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or

4) Has yielded, or may be likely to yield, information important in prehistory or history. [Title 14, California Code of Regulations, Section 4852(b)]

For a resource to be eligible for the CRHR, it must also retain enough integrity to be recognizable as a historic resource and to convey its significance. A resource that does not retain sufficient integrity to meet the NRHP criteria may still be eligible for listing in the CRHR.

CEQA requires lead agencies to determine if a proposed project would have a significant effect on important archaeological resources, either historic resources or unique archaeological resources. If a lead agency determines that an archaeological site is a historic resource, the provisions of PRC Section 21084.1 and CEQA Guidelines Section 15064.5 would apply. If an archaeological site does not meet the CEQA Guidelines criteria for a historic resource, then the site may meet the threshold of PRC Section 21083 regarding unique archaeological resources. A unique archaeological resource is "an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

- Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.

- Has a special and particular quality such as being the oldest of its type or the best available example of its type.
- Is directly associated with a scientifically recognized important prehistoric or historic event or person." [PRC Section 21083.2 (g)]

The CEQA Guidelines note that if a resource is neither a unique archaeological resource nor a historic resource, the effects of the project on that resource shall not be considered a significant effect on the environment (CEQA Guidelines Section 15064[c][4]).

California Public Resources Code

Several sections of the PRC protect paleontological resources. Section 5097.5 prohibits "knowing and willful" excavation, removal, destruction, injury, and defacement of any paleontological feature on public lands (lands under state, county, city, district, or public authority jurisdiction, or the jurisdiction of a public corporation), except where the agency with jurisdiction has granted permission.

Section 7050.5 of the Health and Safety Code protects human remains by prohibiting the disinterment, disturbance, or removal of human remains from any location other than a dedicated cemetery. Section 5097.98 of the PRC (and reiterated in CEQA Guidelines Section 15064.59[e]) also states that in the event of the accidental discovery or recognition of any human remains in any location other than a dedicated cemetery, the following steps should be taken:

(1) There shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until:

  (A) The coroner of the county in which the remains are discovered must be contacted to determine that no investigation of the cause of death is required, and

  (B) If the coroner determines the remains to be Native American:

    1. The coroner shall contact the NAHC within 24 hours.
    2. The NAHC shall identify the person or persons it believes to be the most likely to be descended from the deceased Native American.
    3. The most likely descendent may make recommendations to the landowner or the person responsible for the excavation work for means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods as provided in PRC Section 5097.98, or

(2) Where the following conditions occur, the landowner or his authorized representative shall rebury the Native American human remains and associated grave goods with appropriate dignity on the property in a location not subject to further subsurface disturbance.

  (A) The NAHC is unable to identify a most likely descendent, or the most likely descendent failed to make a recommendation within 24 hours after being notified by the commission.

  (B) The descendant identified fails to make a recommendation; or

(C) The landowner or his authorized representative rejects the recommendation of the descendant, and the mediation by the NAHC fails to provide measures acceptable to the landowner.

5.5.2.3 Local Regulations

San Francisco Historic Preservation Commission and Planning Code Articles 10 and 11

The OHP has included the CCSF on its list of Certified Local Governments, which means that San Francisco has an approved historic preservation ordinance, Historic Preservation Commission, and other formal processes related to historic preservation and cultural resources management. The CCSF reviews the historical resources designated under Articles 10 and 11 of the San Francisco Planning Code when it evaluates impacts on historical resources (see Section 5.5.3.1, Significance Criteria). Article 10 describes procedures regarding the preservation of sites and areas of special character or special historical, architectural, or aesthetic interest or value, such as officially designated city landmarks and buildings included within locally designated historic districts. Article 11 of the Planning Code designated six downtown conservation districts. There are no CCSF-designated landmarks or properties that contribute to designated historic districts in the C-APE.

San Mateo County General Plan

The Conservation Open Space, Parks and Recreation Element of the San Mateo County Draft General Plan (San Mateo County, 2009a) contains a number of goals that are relevant to the protection of cultural resources, including the following:

> **Goal C/OS 7.1: Resource Protection.** Preserve, to the maximum extent feasible, archaeological sites with significant cultural, historical, or sociological merit.
>
> **Goal C/OS 8.1: Historic Preservation.** Preserve, where feasible, historic buildings as follows:
>
> a. Prohibit the demolition of historic buildings until a building permit is authorized subject to approval of a planning application.
>
> b. Require the applicant to submit alternatives on how to preserve the historic building as part of any planning application and implement methods of preservation unless health and safety requirements cannot be met.

5.5.3 Impacts and Mitigation Measures

5.5.3.1 Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to cultural resources, but considers that implementation of the proposed project would have a significant impact on cultural resources if it were to:

- Cause a substantial adverse change in the significance of a historic resource as defined in CEQA Guidelines Section 15064.5, including those resources listed in Article 10 or Article 11 of the San Francisco Planning Code;

- Cause a substantial adverse change in the significance of a unique archaeological resource pursuant to CEQA Guidelines Section 15064.5;
- Directly or indirectly destroy a unique paleontological resource or site or unique geological feature; or
- Disturb any human remains, including those interred outside of formal cemeteries.

5.5.3.2 Approach to Analysis

Architectural/Structural Resources

Potential impacts on architectural resources are assessed by identifying any activities that could affect resources that have been identified as historic resources for the purposes of CEQA. Properties identified as historic resources under CEQA include those that are significant because of their association with important events, people, or architectural styles or master architects, or for their informational value (NRHP and CRHR Criteria A/1, B/2, C/3, and D/4) and that retain sufficient historical integrity to convey their significance. Criterion D/4, however, is typically applied to the evaluation of historic-period archaeological resources and not to architectural resources, as described below. Once a resource has been identified as significant, it must be determined whether the impacts of the project would "cause a substantial adverse change in the significance" of the resource (CEQA Guidelines Section 15064.5[b]). A substantial adverse change in the significance of a historic resource means "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of the historic resource would be materially impaired" (CEQA Guidelines Section 15064[b][1]). A historic resource is materially impaired through the demolition or alteration of the resource's physical characteristics that convey its historical significance and that justify its inclusion in the CRHR (CEQA Guidelines Section 15064.5[b][2][A]).

Archaeological Resources

The significance of most prehistoric and historic-period archaeological sites is usually assessed under NRHP and CRHR Criterion D/4. This criterion stresses the importance of the information potential contained within the site, rather than its significance as a surviving example of a type or its association with an important person or event. Archaeological resources may also be assessed under CEQA as unique archaeological resources, defined as archaeological artifacts, objects, or sites that contain information needed to answer important scientific research questions.

Paleontological Resources

The paleontological analysis identifies the potential to encounter paleontological resources (i.e., plant, animal, or invertebrate fossils or microfossils) during excavations associated with the project. The paleontological potential of the units to be disturbed was determined, and the potential to encounter paleontological resources at each site was evaluated. A potentially significant impact on paleontological resources would occur if: (1) construction of the project component would move or excavate previously undisturbed geologic bedrock (native rock); and (2) the bedrock to be disturbed has a high paleontological potential.

Human Remains

Human remains, including those buried outside of formal cemeteries, are protected under several state laws, including PRC Section 5097.98 and Health and Safety Code Section 7050.5. These laws are identified above in Section 5.5.2.2, State Regulations and Legal Compliance. This analysis considers impacts including intentional disturbance, mutilation, or removal of interred human remains.

5.5.3.3 Impact Summary

Table 5.5-3 lists the proposed project's cultural and paleontological resource impacts and significance determinations.

TABLE 5.5-3
SUMMARY OF IMPACTS – CULTURAL RESOURCES

	Significance Determination	
Impact	**LCSD Site**	**Sampling Station Site**
Impact CP-1: Design and construction effects on the integrity of a historic resource.	SU	N/A
Impact CP-2: Design and construction effects on a historic district.	N/A	N/A
Impact CP-3: Construction impacts on unrecorded archaeological resources.	PSM	PSM
Impact CP-4: Construction impacts on paleontological resources.	PSM	LS
Impact CP-5: Construction impacts on human remains, including those interred outside of formal cemeteries.	PSM	PSM
Impact CP-6: Effects of project operations on historic, archaeological, or paleontological resources or human remains.	PSM	N/A
Impact C-CP: Cumulative impacts on cultural resources.	SU	N/A

B = Beneficial impact
N/A = Not Applicable or no impact
LS = Less than Significant impact, no mitigation required
SM = Significant impact, can be Mitigated to less than significant
PSM = Potentially Significant impact, can be Mitigated to less than significant
SU = Significant Unavoidable impact
PSU = Potentially Significant Unavoidable impact

5.5.3.4 Design and Construction Impacts

Historic Architectural Resources

Impact CP-1: Design and construction effects on the integrity of a historic resource.

Lower Crystal Springs Dam Vicinity

In order to meet project objectives, the proposed project requires substantial alteration of a number of the character-defining features that contribute to the historical significance of the LCSD. As mandated by the DSOD, the spillway design must accommodate the flow from the Probable Maximum Flood, which is more than five times larger than the flow for which the dam is currently designed. To meet these flow requirements, the parapet wall must be raised by 9 feet (from elevation 293 to 302 feet) and widened by about 120 feet (from 88 to about 208 feet); these alterations cannot be done without substantially modifying the appearance of the dam. Other design changes to the dam mandated by the DSOD flow requirements and affecting the appearance of the dam are: two new spillway bays, including sidewalls and spillway floors, that would be built on either side of the existing spillway; a new, curved concrete crest built on the spillway to permanently maintain the dam crest at an elevation of 291.8 feet and to promote efficient flow of water through the spillway and minimize risk of structural damage to the dam; partial removal of the central part of the existing parapet wall (60 feet on each side of the existing spillway) to allow spillway expansion; demolition of the existing training walls that confine flow within the spillway and the supporting structure for the stoplogs; and installation of drainage improvements at the top of the dam to prevent ponding that would require filling the depressed areas with crushed concrete and constructing drainage channels that drain to the downstream face of the dam. In addition, as described in Chapter 3, Project Description, the proposed project would replace the existing stilling basin at the downstream toe of the dam with a new stilling basin more than five times larger and would include a 10.5-foot-thick concrete floor and concrete side walls that are 32.5 feet high; these DSOD-required modifications to the stilling basin would contribute to the substantial alteration of the physical appearance of the LCSD. As described in Chapter 8, Alternatives, any structural improvements to the LCSD that are required to comply with DSOD requirements, regardless of the specific design, would modify the historical characteristics of the dam.

The proposed project would significantly affect the integrity of the dam's design (new spillway, stilling basin, drainage control measures) as well as its setting (stilling basin), materials and workmanship (new spillway, reconstructed parapet wall, stilling basin, drainage control measures), and feeling and association (all of the above). Therefore, a number of the character-defining features that contribute to the eligibility of this property and convey its historical significance would be substantially altered, diminishing the integrity of the resource. The project would cause a substantial adverse change because the project would materially impair the LCSD in a manner that would diminish the characteristics that justify its inclusion in the CRHR.

While mitigation is available to reduce the severity of this impact through photographic and written documentation, such measures would not fully reduce the impact to a less-than-significant level. Furthermore, it is infeasible from a design and engineering standpoint for the SFPUC to achieve its project objectives (e.g., ability to safely pass PMF) without having a significant impact on the integrity of the dam as a historical resource. No alterations to the dam that would meet this project objective would avoid significant changes to the physical appearance of this historic facility (SFPUC, 2007), and to change the flow requirements would require approval of the DSOD. Therefore, even with implementation of Mitigation Measures M-CP-1a (HAER Recordation and Public Interpretation) and M-CP-1b (Historic Resources Protection Plan), the design and construction of the proposed project would substantially alter the integrity of a historic resource—the LCSD—and this impact would be *significant and unavoidable*. Potential impacts on the South Crystal Springs Cottage are discussed below in Section 5.5.3.5, Operational Impacts.

Sampling Station #5 Vicinity

Sampling Station #5 is a water quality sampling station located at the Pulgas Discharge Channel. The prefabricated sampling station was installed within the last three years to aid in complying with water quality standards. The station would be raised to accommodate the proposed changes in reservoir operations once the dam improvements are completed. Due to the station's relatively recent date of construction, this property would not be eligible for listing in the NRHP or CRHR and would not be considered a historic resource. As such, alterations to Sampling Station #5, including raising its foundation, would have *no impact* on historic resources.

Impact CP-2: Design and construction effects on a historic district.

A historic district is an area that "possesses a significant concentration, linkage or continuity of sites, buildings, structures, or objects, united historically or aesthetically by plan or physical development." This analysis assesses impacts on potentially interrelated groups of facilities and resources that are united by historic plan and function and that could be considered discrete historic districts. Significant historic districts that retain sufficient historical integrity to convey their significance are considered singular historic resources for the purposes of CEQA compliance and can include contributing and noncontributing elements. The proposed project would have an effect on a potential historic district within the San Francisco Peninsula water system if it were to remove or alter individual resources within a district in a manner that would diminish the district's historical integrity, and thus its ability to convey its significance, purpose, or original appearance.

In May 2008, JRP Consulting, LLC conducted an analysis of potential historic districts that could be affected by the proposed WSIP projects. According to this analysis, there are no known historic districts, nor do there appear to be any potential historic districts, comprised of SFPUC regional water system facilities along the east side of Crystal Springs Reservoir or in the area north to San Andreas Reservoir, including the vicinities of the UCSD, the LCSD, and San Andreas Dam. This encompasses the areas that could be affected by the LCSDI project (JRP, 2008). As noted in this report, SFPUC water system facilities in the Crystal Springs Reservoir area have overlapping features built by the Spring Valley Water Company and by the City of San Francisco at different time periods. It is unlikely that there is a historic district related to either all or a portion of Spring Valley's development of Crystal Springs Reservoir or to the City's alterations and additions in this vicinity. The water system lacks a cohesive plan encompassing all of these facilities, as well as historical significance in linking the various features and the historical integrity within a distinct period of significance that would be necessary for a historic district to be present. The report states that the LCSD does not appear to be part of any historic district (JRP, 2008). As such, alterations to the dam under the proposed project would have *no impact* on historic resources, including existing or potential historic districts. Similarly, proposed modifications to Sampling Station #5 as a recently constructed facility in the regional system would have *no impact* on historic resources, including existing or potential historic districts.

Archaeological Resources

Impact CP-3: Construction impacts on unrecorded archaeological resources.

Lower Crystal Springs Dam Vicinity

No archaeological resources were identified within the LCSD C-APE, including the dam site. The extended survey conducted in the recorded location of CA-SMA-126 did not uncover any cultural materials. The site either no longer possesses an archaeologically discernible deposit or is inundated by the reservoir, or the previously documented location is outside of the C-APE. There is, however, a low potential for uncovering unknown archaeological resources during ground-disturbing project construction efforts at the dam site. Accidental damage to or destruction of significant archaeological resources would be a *potentially significant* impact. However, implementation of Mitigation Measure M-CP-3 (Procedures Addressing Inadvertent Discovery of Archaeological Resources) would reduce the impact to a less-than-significant level by halting work if archaeological materials are uncovered during earthmoving activities and having a qualified archaeologist evaluate the find.

Sampling Station #5 Vicinity

No archaeological resources were identified within the Sampling Station #5 C-APE. There is, however, a low potential for uncovering unknown archaeological resources during ground-disturbing project construction efforts. Accidental damage to or destruction of significant archaeological resources would be a *potentially significant* impact. However, implementation of Mitigation Measure M-CP-3 (Procedures Addressing Inadvertent Discovery of Archaeological Resources) would reduce the impact to a less-than-significant level by halting work if archaeological materials are uncovered during earthmoving activities and having a qualified archaeologist evaluate the find.

Paleontological Resources

Impact CP-4: Construction impacts on paleontological resources.

Lower Crystal Springs Dam Vicinity

Excavations required for the stilling basin at the base of the LCSD would cut into bedrock, which is composed of the Franciscan Complex, as well as Holocene alluvium. As discussed in Section 5.5.1.3, Archaeological/Prehistoric Setting, no known fossil sites are present in the project area, and the Franciscan Complex and Holocene alluvium are not fossil-bearing geologic units. Thus, earthmoving activities for the project are unlikely to disturb or destroy paleontological resources because no resources are known to exist and the potential for the occurrence of undiscovered resources is low. Nevertheless, excavations required to expand the stilling basin would involve substantial volumes of soil, and fossils could still be present in Holocene alluvium, even though it is not generally fossil-yielding. Accidental damage to or destruction of significant paleontological resources during project construction would be a *potentially significant* impact. However, implementation of Mitigation Measure M-CP-4 (Procedures Addressing Unanticipated Discovery of a Paleontological Resource) would reduce the impact to a less-than-significant level by halting work if fossils are uncovered during earthmoving construction activities. If a qualified paleontologist determines the discovery is unique and significant, Mitigation Measure M-CP-4 requires it to be appropriately salvaged.

Sampling Station #5 Vicinity

Sampling Station #5 is located in a similar geologic setting, with Holocene alluvium forming surface deposits over hard consolidated rocks of the Franciscan Complex. These are rock units with a low paleontological potential, and activities at this site would involve minimal excavation of undisturbed rock and sediment. Thus, impacts related to potential accidental damage to or destruction of significant paleontological resources during excavations for foundations and footings would be *less than significant*, and no mitigation is required.

Human Remains

Impact CP-5: Construction impacts on human remains, including those interred outside of formal cemeteries.

Lower Crystal Springs Dam Vicinity

Although no known burial locations are within the LCSD C-APE, unrecorded remains could exist anywhere. Project construction could potentially encounter unrecorded human remains and result in direct impacts on such human remains, which would be a *potentially significant* impact. However, implementation of Mitigation Measure M-CP-5 (Procedures Addressing Inadvertent Discovery of Human Remains) would reduce this impact to a less-than-significant level by halting work if human remains or associated funerary objects are found during construction, and contacting the county coroner.

Sampling Station #5 Vicinity

Although no known burial locations are within the Sampling Station #5 C-APE, unrecorded remains could exist anywhere. Project construction could potentially encounter unrecorded human remains and result in direct impacts on such human remains, which would be a *potentially significant* impact. However, implementation of Mitigation Measure M-CP-5 (Procedures Addressing Inadvertent Discovery of Human Remains) would reduce this impact to a less-than-significant level by halting work if human remains or associated funerary objects are found during construction, and contacting the county coroner.

5.5.3.5 Operational Impacts

Impact CP-6: Effects of project operation on historic, archaeological, or paleontological resources or human remains.

Architectural Resources

Operation of the proposed project would raise the maximum normal operating level of Crystal Springs Reservoir by 4 feet (from 283.8 to 287.8 feet) compared to existing operations. In addition, future operations are proposed to include periodic events when the reservoir level could be higher than 287.8 feet (referred to as short-term exceedances); these periodic exceedances are expected to occur two to three times per year and about one year in three, which could raise the water level to as high as 291.8 feet, which is within about 2 feet of the terraced backyard of the historic South Crystal Springs Cottage. If water levels were to reach 291.8 feet in the future under the proposed project (even though these occurrences are expected to be infrequent), wave action over time could erode the terrace that supports this historic resource. While there would be no direct effects on the cottage structure itself, rising water levels and associated wave erosion during these short-term exceedances would occur during large storms over the watershed, and the combination of meteorological conditions and the elevated reservoir levels could indirectly endanger the cottage in the future through ground subsidence/soil erosion, which could cause damage to the structure itself. In addition, the cottage is served by a small, ancillary pump house to the northeast that would be located below the maximum water elevation that could occur under proposed operations. Damage to the pump house would inhibit use of the cottage and undermine fire safety for the historic cottage due to loss of water pressure/supply. Although this impact would be a *potentially significant*, implementation of Mitigation Measure M-CP-6 (Conduct a Geotechnical Study to Evaluate the Condition of the Retaining Wall, and if Necessary, Relocate and Extend the South Crystal Springs Cottage Retaining Wall) would reduce the indirect project impact on the cottage to a less-than-significant level.

Archaeological Resources, Paleontological Resources, and Human Remains

The extended survey for the location of site CA-SMA-126 demonstrated that the site no longer possesses an archaeologically discernible deposit, is inundated by the reservoir, or may be located outside of the C-APE. Nevertheless, increased water levels associated with project operation could expose, and potentially damage, previously unrecorded archaeological and paleontological resources, as well as human remains, anywhere along the reservoir shoreline. However, as project operations would restore the historical capacity of the reservoir, the higher water levels would be within the same range as levels under historical operations prior to the 1983 DSOD restrictions. Because no previously unrecorded archaeological/ paleontological resources or human remains have been exposed since operational water levels were lowered in 1983, no significant impacts on cultural resources are anticipated as a result of project operations.

At the sampling station site, project operations would be the same as existing operations, and there would be *no effects* on cultural resources.

5.5.3.6 Mitigation Measures

Mitigation Measure M-CP-1a: HAER Recordation and Public Interpretation.

The SFPUC shall hire a qualified cultural resources specialist to document the LCSD with a historical narrative and large format photographs in a manner consistent with the Historic American Engineering Record (HAER). Copies of the narrative and photographs shall be distributed to the San Francisco Public Library (Main Branch), branches of the San Mateo County Library system, as well as the San Mateo County Historical Association and San Mateo County History Museum, the History and Heritage Committee for Engineers, the Millbrae Historical Society, the Hillsborough Historical Society, and the Burlingame Historical Society. The preparation of the HAER document shall follow standard National Park Service procedures (NPS, 1990).

There will be three main tasks: gather data, prepare photographic documentation, and prepare a written historical and descriptive report. Photographic documentation shall include 4- by 5-inch negatives in labeled sleeves, 8- by 10-inch prints mounted on labeled photo cards, and an index to the photographs. Photographs shall be taken of the LCSD's character-defining features, including but not limited to the parapet wall, spillway, stilling basin, and abutments, as well as the historical setting of the dam. The research shall include possible photographic reproduction of any valuable engineering blueprints. The SFPUC shall coordinate and consolidate HAER recordation of the LCSD with recordation of its associated Outlet Structure 1 (OS-1), the latter of which is a mitigation measure identified in the CSSA Transmission Upgrade EIR.

The SFPUC shall also develop interpretive panels for the LCSD. The panels shall include a history of the resource and some drawings or photographs depicting the unique design and history of the dam. As appropriate, information about the relationship between the dam and OS-1 shall be included. The panels shall be displayed at publicly accessible areas adjacent to the dam. The objective of the interpretive panels is to increase local and regional public awareness of this resource as well as awareness of the SFPUC's efforts to educate citizens about the history of the regional water system.

Much of the information gathered for the HAER recordation effort, described above, can be reused in the interpretive panels.

Mitigation Measure M-CP-1b: Historic Resources Protection Plan.

The SFPUC shall hire a qualified historian to prepare a historic resources protection plan that specifies procedures for protecting the LCSD during construction and a monitoring method to be employed by the contractor working near the LCSD. At a minimum, the plan will address the operation of construction equipment adjacent to the dam, storage of construction materials away from the dam, and education/training of construction workers about the dam's historical significance. The SFPUC shall implement the plan throughout construction at the dam site. The purpose of this measure is to protect other portions of the dam from accidental damage during construction that would not already be affected by the proposed project. This measure is considered an additional layer of protection for the historic dam, which is listed in the NRHP, and should be afforded as much protection from accidental damage during construction as possible.

Mitigation Measure M-CP-3: Procedures Addressing Inadvertent Discovery of Archaeological Resources.

To avoid any potential adverse project effects from the accidental discovery of buried or submerged historic resources, as defined in CEQA Guidelines Section 15064.5(a)(c), the SFPUC shall distribute the Planning Department's archaeological resource "ALERT"[4] sheet to the project's prime contractor; any project subcontractor firms (including demolition, excavation, grading, foundation, pile driving, etc.); and/or utilities firm involved in soil-disturbing activities within the project site. Prior to any soil-disturbing activities, each contractor shall be responsible for ensuring that the ALERT sheet is circulated to all field personnel, including machine operators, field crew, pile drivers, supervisory personnel, etc. The SFPUC shall provide the Environmental Review Officer (ERO) with a signed affidavit from the responsible parties (prime contractor, subcontractor(s), and utilities firm) confirming that all field personnel have received copies of the ALERT sheet.

If the ERO determines that an archaeological resource may be present within the project site, the SFPUC shall retain the services of a qualified archaeological consultant. The archaeological consultant shall advise the ERO as to whether the discovery is an archaeological resource that retains sufficient integrity and is of potential scientific/historical/cultural significance. If an archaeological resource is present, the archaeological consultant shall identify and evaluate the archaeological resource. The archaeological consultant shall make a recommendation as to what action, if any, is warranted. Based on this information, the ERO may require, if warranted, specific additional measures to be implemented by the SFPUC. These measures might include: preservation in-situ of the archaeological resource; an archaeological monitoring program; or an archaeological evaluation program. If an archaeological monitoring program or archaeological testing program is required, it shall be consistent with the WSIP Archaeological Guidance (MEA, 2008) for such programs. The ERO may also require that the project sponsor immediately implement a site security program if the archaeological resource is at risk from vandalism, looting, or other damaging actions.

The project archaeological consultant shall submit an accidental discovery archaeological data recovery report (ADRR) to the ERO which, in addition to the usual contents of the ADRR, shall include: (1) an evaluation of the historical significance of any discovered archaeological resource; (2) a description of the archaeological and historical research methods employed in the archaeological monitoring/data recovery program(s) undertaken; and (3) a presentation, analysis, and interpretation of the recovered data. Information that may put at risk any archaeological resource shall be provided in a separate removable insert within the final report.

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[4] The ALERT sheet states that in the event of discovery of the following cultural materials, all work must be stopped in the area and the Environmental Review Officer contacted to evaluate the find: concentrations of shellfish remains; evidence of fire (ashes, charcoal, burnt earth, fire-cracked rocks); concentrations of bones; recognizable Native American artifacts (arrowheads, shell beads, stone mortars [bowls], humanly shaped rock); building foundation remains; trash pits, privies (outhouse holes); floor remains; wells; concentrations of bottles, broken dishes, shoes, buttons, cut animal bones, hardware, household items, barrels, etc.; thick layers of burned building debris (charcoal, nails, fused glass, burned plaster, burned dishes, etc.); wood structural remains (building, ship, wharf, etc.); clay roof/floor tiles; stone walls or footings; or gravestones.

Once approved by the ERO, copies of the ADRR shall be distributed as follows: the relevant California Historical Resources Information System Information Center shall receive one copy, and the ERO shall receive a copy of the transmittal letter of the ADRR to the Information Center. The San Francisco Planning Department, Major Environmental Analysis Division shall receive three copies of the ADRR along with copies of any formal site recordation forms (California Department of Parks and Recreation Form 523 series) and/or documentation for nomination to the NRHP/CRHR. The SFPUC shall receive copies of the ADRR in the number requested. In instances of high public interest in or the high interpretive value of the resource, the ERO may require a different final report content, format, and distribution than that presented above.

Mitigation Measure M-CP-4: Procedures Addressing Unanticipated Discovery of a Paleontological Resource.

If a paleontological resource (fossilized invertebrate, vertebrate, plant, or microfossil) is found during project construction, excavations within 50 feet of the find shall be temporarily halted or diverted, and the ERO shall be contacted to determine how to evaluate the find in the most expeditious manner possible. Typically, the ERO would recommend that a qualified paleontologist be called to the site to document the discovery and evaluate whether the fossil is significant and worthy of salvage. If the fossil is determined to be significant and avoidance is not feasible, the paleontologist, in consultation with the SFPUC and the ERO, shall develop and implement an excavation and salvage plan in accordance with Society of Vertebrate Paleontology standards (SVP, 1995; SVP, 1996).

Mitigation Measure M-CP-5: Procedures Addressing Inadvertent Discovery of Human Remains.

The treatment of human remains and associated or unassociated funerary objects discovered during any soil-disturbing activity shall comply with applicable state law. State law requires immediate notification of the coroner of the county within which the project is located and, in the event of the coroner's determination that the human remains are Native American, notification of the NAHC, which would appoint a Most Likely Descendent (MLD) (PRC Section 5097.98). The MLD would make all reasonable efforts to develop an agreement for the treatment, with appropriate dignity, of human remains and associated or unassociated funerary objects (CEQA Guidelines Section 15064.5[d]). The agreement shall take into consideration the appropriate excavation, removal, recordation, analysis, custodianship, curation, and final disposition of the human remains and associated or unassociated funerary objects. The PRC allows 48 hours to reach agreement on these matters. If the MLD and the other parties do not agree on the reburial method, the landowner shall follow PRC Section 5097.98(b), which states that "the landowner or his or her authorized representative shall reinter the human remains and items associated with Native American burials with appropriate dignity on the property in a location not subject to further subsurface disturbance."

Mitigation Measure M-CP-6: Conduct a Geotechnical Study to Evaluate the Condition of the Retaining Wall, and if Necessary, Relocate and Extend the South Crystal Springs Cottage Retaining Wall.

The SFPUC shall conduct a geotechnical study to evaluate the structural condition of the existing masonry retaining wall along the western edge of the South Crystal Springs Cottage property. If the study determines that the wall cannot withstand the infrequent and short-term water-level exceedances up to 291.8 feet during large storms over the watershed, the wall shall be relocated a few feet back from the new shoreline edge and extended along the entire terraced edge of the cottage property to prevent soil erosion due to wave action. This effort would eliminate any potential future direct effects on the cottage due to rising water levels in the reservoir. If the study determines that the retaining wall can withstand the infrequent and short-term exceedances of 291.8 feet during large storms over the watershed, no improvements to the wall would be necessary. If the proposed project threatens the functionality of the ancillary pump house, the SFPUC shall relocate the pump house to higher ground to preserve water supply and fire fighting capability for the cottage.

5.5.3.7 Cumulative Impacts and Mitigation Measures

Impact C-CP: Cumulative impacts on cultural resources.

Many of the projects of other jurisdictions and other SFPUC projects in the LCSD vicinity (see Section 5.1, Overview, Table 5.1-1) are not located in or near the C-APE and would have no potential to create a significant cumulative impact on cultural resources when considered in combination with the LCSDI project. However, there are four other projects that would overlap geographically and temporally with the proposed project, and implementation of these projects in combination with the LCSDI project could result in potentially significant cumulative impacts on cultural resources. These are: (1) San Mateo County's Crystal Springs Dam Bridge Replacement project; (2) upgrade and repair of the LCSD outlet structures as part of the SFPUC's CSSA Transmission Upgrade project; (3) replacement of a segment of pipeline east of Crystal Springs Road and south of Woodridge Road, across San Mateo Creek, as part of the SFPUC's Crystal Springs Pipeline No. 2 (CSPL2) Replacement project; and (4) the SFPUC's Pulgas Discharge Channel Modifications project. Impacts on architectural resources associated with all of these projects, in combination with the proposed project, are described below.

Architectural Resources

San Mateo County Crystal Springs Dam Bridge Replacement Project

The 1924 Skyline Boulevard Bridge is ineligible for listing in the NRHP and, accordingly, San Mateo County determined that the replacement of this bridge would not result in a significant impact to historic resources (San Mateo County, 2009b). The preparers of this document concur with this finding. This project would replace one noncontributing element to the LCSD with another. As such, the impacts of this project would not combine with those of the proposed project to form a significant cumulative impact.

Crystal Springs/San Andreas Transmission Upgrade Project

Implementation of the proposed CSSA Transmission Upgrade project would result in a significant and unavoidable impact on architectural resources, and when considered in combination with the LCSDI project, would result in a significant cumulative impact on historic resources.

OS-1 and OS-2, located immediately north of the LCSD, were evaluated for their historical significance as part of the SFPUC's CSSA Transmission Upgrade project (San Francisco Planning Department, 2009a). Only OS-1 appears eligible for listing in the NRHP (Criterion C) as a contributor to the LCSD, while OS-2 does not appear eligible. Alterations to OS-1 would include demolishing and removing the free-standing portion of the outlet shaft/tower, the access bridge, and many of the structure's internal workings (e.g., standpipes and valves). These activities would result in a substantial loss of integrity to OS-1 and would have a significant impact on the historical significance of this resource. Even with implementation of mitigation measures such as HAER documentation of OS-1, this impact would remain significant and unavoidable (San Francisco Planning Department, 2009a). As OS-1 is considered a contributory feature of the historic LCSD, the CSSA Transmission Upgrade project, in combination with the proposed alterations to the dam, would have a cumulatively considerable impact on historic resources. Mitigation Measure M-CP-1a (HAER Recordation and Public Interpretation), requiring photo documentation and public interpretation (in the form of informational panels) of the LCSD, as well as measures requiring coordinated and consolidated recordation of OS-1 as part of the CSSA Transmission Upgrade EIR, would reduce but not fully avoid the significant cumulative impacts of both projects. Therefore, the contribution of the proposed project to cumulative impacts on historic architectural resources would be cumulatively considerable and is considered *significant and unavoidable*.

Crystal Springs Pipeline No. 2 Replacement Project

Replacement of a segment of the pipeline east of Crystal Springs Road across San Mateo Creek in Hillsborough as part of the SFPUC's CSPL2 Replacement project would have a potentially significant impact on one architectural resource: a 1920s-era concrete bridge at Sierra Drive (San Francisco Planning Department, 2009b). The bridge appears to be eligible for the NRHP/CRHR at the local level under Criterion A/1. The environmental review for this project has identified that nearby construction-related vibration associated with pipeline replacement could damage this historic resource (San Francisco Planning Department, 2009b). Mitigation measures to reduce this potentially significant impact to a less-than-significant level include monitoring for excessive vibration or prohibiting vibratory construction activities within 30 feet of this resource. Implementation of this mitigation measure would reduce any potentially significant impacts to a less-than-significant level. Furthermore, the respective cultural resource impacts of the LSCDI project and the CSPL2 Replacement project are distinct and do not combine to affect any particular historical resource or historical district. As such, no cumulative impacts on historic resources associated with the proposed project, in combination with the Crystal Springs Pipeline No. 2 Replacement Project, would occur.

Pulgas Discharge Channel Modifications Project

Modifications to the existing 1920s-era Pulgas Discharge Channel are planned to improve the structural integrity of the channel and to accommodate an anticipated maximum peak flow of 250 million gallons per day. Project components include increasing the height of the channel walls by 3 feet near the outlet structure and by 1 foot at the remaining portions. The Pulgas Discharge Channel has been found ineligible for listing in the NRHP and CRHR and, as such, is not considered a historic resource for CEQA purposes (San Francisco Planning Department, 2008). Alterations to this structure would have no significant impact on historic resources. Therefore, the impacts of the proposed raising of Sampling Station #5, in combination with those of the Pulgas Discharge Channel Modifications project, would have no cumulative impacts on historic resources.

Archaeological Resources, Paleontological Resources, and Human Remains

While the proposed project and the projects listed above would have ground-disturbing elements that could damage or destroy previously unrecorded archaeological or paleontological resources as well as human remains, implementation of Mitigation Measures M-CP-2, M-CP-3, and M-CP-4, as well as standard archaeological mitigation measures that are expected to be implemented for the above projects, would reduce the project's contribution to a less-than-cumulatively considerable level such that there would be no cumulative, adverse impacts on these resources.

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5.6 Transportation and Circulation

This section provides an overview of existing transportation conditions within the Lower Crystal Springs Dam Improvements (LCSDI) project area; evaluates the potential impacts on traffic, transportation, and circulation that could result from construction and operation of the proposed project; and identifies mitigation measures, as appropriate.

5.6.1 Setting

The proposed project is located within unincorporated San Mateo County. The Lower Crystal Springs Dam (LCSD) site is located on Skyline Boulevard, just west of Interstate 280 (I-280). Sampling Station #5 is at the Pulgas Discharge Channel, approximately four miles south of the LCSD and immediately west of the Pulgas Water Temple. Both project sites are situated in rural areas west of the incorporated areas of Hillsborough, San Mateo, Belmont, and San Carlos. The project area for this traffic, transportation, and circulation analysis encompasses the regional highways and local roadways that would be used for access by construction workers and construction vehicles, which would include the trucks used to transport construction materials and excavated spoil materials to and from the work areas.

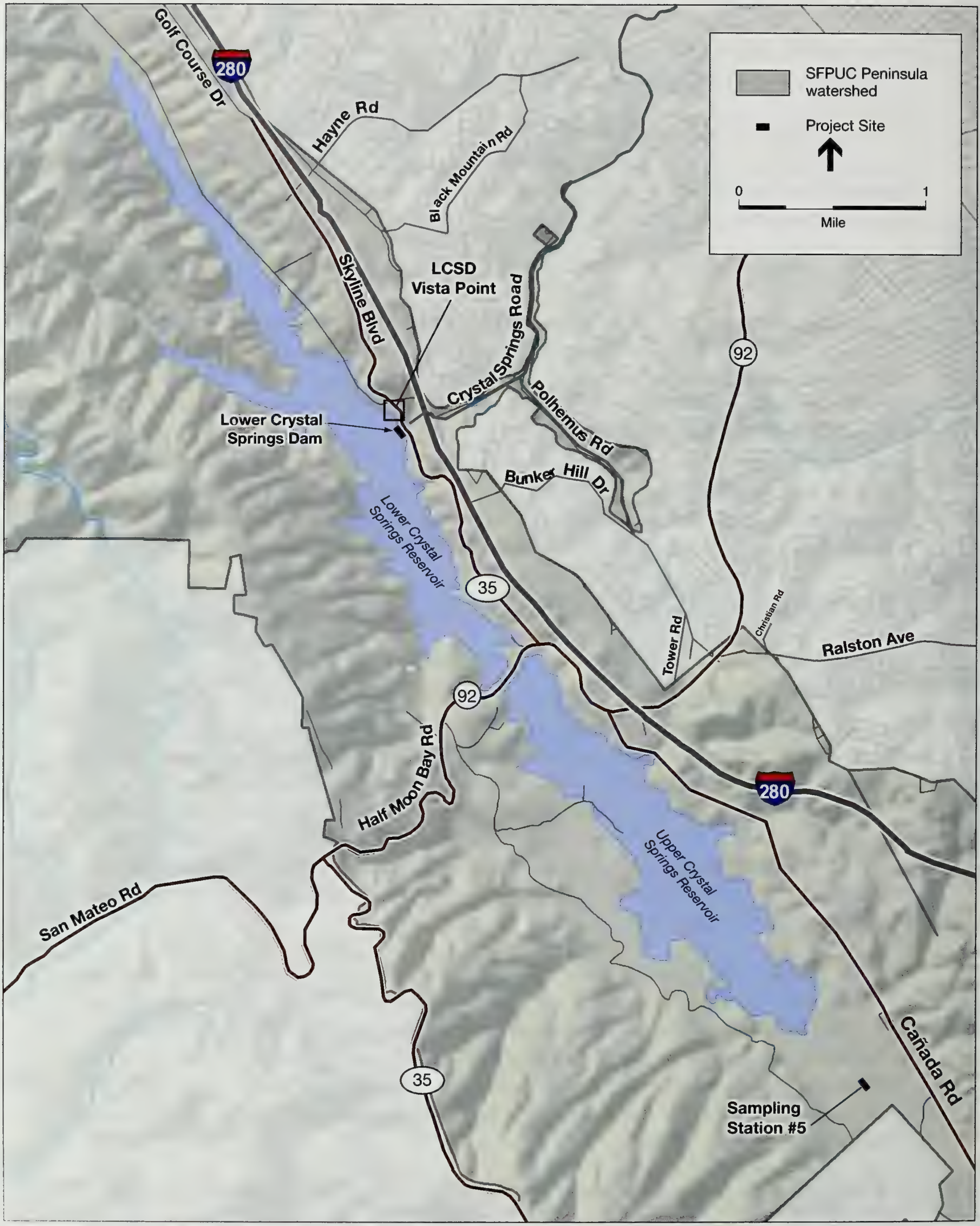
5.6.1.1 Regional and Local Roadways

Roadway Network

Roadways in the project area are shown on **Figure 5.6-1**. Regional access to the LCSD site is provided by I-280 and Highway 92, with local access provided via Skyline Boulevard (Highway 35) and Crystal Springs Road. In the project area, I-280 runs north-to-south and is an eight-lane divided freeway. Access to the LCSD site from I-280 is provided at Bunker Hill Drive (via ramps that are between 0.4 and 0.6 mile to the south of LCSD) and at Black Mountain Road/Hayne Road (via ramps that are 1.5 miles to the north of LCSD). Highway 92 is an east-west freeway extending between I-880 in Hayward on the east and Highway 1 in Half Moon Bay on the west. Highway 92 is a two-lane roadway between Highway 1 and I-280, and a four-lane divided freeway between I-280 and I-880.

In the immediate project area, Skyline Boulevard, Crystal Springs Road, and Cañada Road are rural roadways providing access to recreational facilities at and around Crystal Springs Reservoir. Skyline Boulevard is a north-south roadway that extends between Black Mountain Road/Hayne Road in Hillsborough and Highway 92. The Skyline Boulevard Bridge runs along the top of the LCSD; the bridge is under the jurisdiction of San Mateo County. Skyline Boulevard has two travel lanes, and in the project area the speed limit on Skyline Boulevard ranges between 25 and 40 miles per hour (mph).

Crystal Springs Road runs east-to-west between Skyline Boulevard and El Camino Real in San Mateo. In the project area, Crystal Springs Road is a two-lane roadway with narrow shoulders and has a speed limit of 35 mph. Skyline Boulevard and Crystal Springs Road cross at



SOURCE: ESA + Orion, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.6-1
Key Roadways in the Project Area

an unsignalized, four-way, stop-sign-controlled intersection. Cañada Road is a two-lane roadway with narrow shoulders and a speed limit of 35 mph; it is closed on Sundays to motor vehicles for "Bicycle Sundays" (described below under the heading Bicycle and Pedestrian Network and also in Section 5.10 Recreation).

Polhemus Road generally is a north-south roadway that extends between Crystal Springs Road and Tower Road just north of Highway 92. South of Tower Road, Polhemus Road continues as Ralston Avenue. Polhemus Road generally has one lane in each direction, and the speed limit is 45 mph.

In the vicinity of the Pulgas Discharge Channel and Sampling Station #5, Cañada Road is a two-lane rural roadway providing access to recreational facilities. Edgewood Road connects Cañada Road with the I-280 on-ramps and off-ramps at the Edgewood Road interchange.

Traffic Volumes

Weekday vehicle traffic on I-280 consists primarily of commuter traffic within the peak traffic periods (generally between the hours of 7:00 to 9:00 a.m. and 4:00 to 6:00 p.m.), although a mix of residential, commercial, and industrial vehicle traffic occurs throughout the day. **Table 5.6-1** presents the most recent average daily traffic volumes published by the California Department of Transportation (Caltrans) on the regional freeways in the project area (Caltrans, 2008). I-280 carries substantially more traffic than Highway 92. Trucks represent between 2 and 5 percent of daily traffic volumes (Caltrans, 2007).

TABLE 5.6-1
DAILY TRAFFIC VOLUMES ON REGIONAL FREEWAYS

Location	Average Daily Traffic Volume	Trucks, as a Percentage of Daily Traffic
I-280	103,000 to 107,000	2
Highway 92	22,400 to 76,000	5

SOURCE: Caltrans, 2007, 2008.

Table 5.6-2 presents the average daily traffic volumes as well as peak-hour traffic volumes on roadways providing access to the project sites. In general, traffic volumes on Skyline Boulevard and Crystal Springs Road in the project area are low throughout the day, and traffic flows without significant conflicts or congestion. The weekday average daily traffic on Skyline Boulevard and Crystal Springs Road ranges between 1,300 and 2,000 vehicles per day, with peak-hour volumes ranging between 90 and 320 vehicles per hour (LCW Consulting, 2009a; CHS Consulting, 2009). Traffic volumes on Polhemus Road are higher, with about 3,700 daily vehicles per day, and between 440 and 480 vehicles per hour during the peak hours (CHS Consulting, 2009).

TABLE 5.6-2
DAILY AND PEAK-HOUR TRAFFIC VOLUMES ON LOCAL ROADWAYS

Location	Average Daily Traffic Volume	AM Peak Hour Volume	PM Peak Hour Volume
Skyline Boulevard – south of Hayne Road	2,000	310	320
Skyline Boulevard – south of Crystal Springs Road	1,300	90	120
Crystal Springs Road – east of Skyline Boulevard	1,320	250	210
Polhemus Road – south of Crystal Springs Road	3,700	480	440
Cañada Road	1,800	N/A	N/A
Edgewood Road	2,800	N/A	N/A

N/A = Not available

SOURCES: San Mateo, 2006; LCW Consulting, 2009a; CHS Consulting, 2009.

In the vicinity of Sampling Station #5, average traffic volumes are about 1,800 vehicles per day on Cañada Road, and about 2,800 vehicles per day on Edgewood Road between Cañada Road and I-280 (San Mateo County, 2006).

Transit Service

San Mateo County Transit District is the primary bus service provider in San Mateo County. The nearest Bay Area Rapid Transit (BART) station is about two miles northeast of the LSCD site, in the city of Millbrae. There is no regularly scheduled bus service on Skyline Boulevard or Crystal Springs Road in the vicinity of the LCSD site, nor on Cañada Road or Edgewood Road in the vicinity of Sampling Station #5.

Bicycle and Pedestrian Network

Bicycle routes in the project area are officially designated by the City/County Association of Governments (C/CAG) of San Mateo County. Bikeways are typically classified as Class I, II, or III facilities.[1] Class I bikeways are designated bike paths with exclusive right-of-way for use by bicyclists or pedestrians. Class II bikeways are bike lanes striped with the paved areas of roadways and established for the preferential use of bicycles, while Class III bikeways are signed bike routes that allow bicycles to share streets or sidewalks with vehicles or pedestrians. The C/CAG of San Mateo County also identifies popular bicycle routes that have not been formally classified by San Mateo County but that have been identified as popular routes through public surveys and workshops (C/CAG of San Mateo County, 2000).

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[1] Bicycle facilities are defined by the State of California in the California Streets and Highway Code, Section 890.4.

The designated Class I bikeways in the project area are the off-street bike paths along the Sawyer Camp Trail and the Ralston Trail. There are Class II bicycle lanes along Skyline Boulevard, Crystal Springs Road, Cañada Road, Polhemus Road, and Ralston Avenue. Skyline Boulevard is a designated Class II bikeway between Hayne Road/Black Mountain Road and Trousdale Drive; Crystal Springs Road is a designated Class II bikeway between Skyline Boulevard and Polhemus Road, and between El Cerrito Avenue and Maple Street; all of Cañada Road is a designated Class II bikeway; all of Polhemus Road is a designated Class II bikeway; and Ralston Avenue is a designated Class II bikeway from Polhemus Road to the Lyall Avenue/Pullman Avenue junction (northeast of the project area). Crystal Springs Road between Polhemus Road and El Cerrito Avenue is designated as a Class III bikeway (C/CAG of San Mateo County, 2009). Designated bikeways and popular bicycle routes in the project area are shown in Section 5.10, Recreation, Figure 5.10-1.

Recreational bicyclists riding on Skyline Boulevard and Crystal Springs Road were counted during weekday and weekend field observations in May and August 2009. The counts were conducted on sunny days on a Wednesday between 4:00 and 6:00 p.m. and on a Sunday between 12:00 and 2:00 p.m. (LCW Consulting, 2009b). **Table 5.6-3** presents the bicycle count for the highest one-hour period during the count period. On both roadways, more bicyclists were observed during the Sunday count than during the weekday count. On Sundays, the predominant direction of bicycle travel was from Skyline Boulevard northbound to Crystal Springs Road eastbound. Conflicts between bicyclists and vehicular traffic were not observed, possibly due to the relatively low traffic volumes on these local roadways during field observations.

TABLE 5.6-3
BICYCLE VOLUMES ON SKYLINE BOULEVARD AND CRYSTAL SPRINGS ROAD

Location	Weekday PM Peak Hour	Sunday Midday Peak Hour
Skyline Boulevard (south of Crystal Springs Road)	15	58
Crystal Springs Road (east of Skyline Boulevard)	8	58

SOURCE: LCW Consulting, 2009b.

Cañada Road, between Edgewood Road to the south and Highway 92 to the north, is closed to automobile traffic on Sundays for an event called "Bicycle Sundays," which is sponsored by the San Mateo County Department of Parks. Recreational bicyclists were observed on Cañada Road during weekday and weekend field observations.

There are no pedestrian facilities on Skyline Boulevard, Crystal Springs Road, or Cañada Road, and pedestrian volumes along these roadways in the vicinity of the LCSD and Sampling Station #5 project sites are very low throughout the weekdays, as the predominant mode of travel in the area is by automobile. On weekends, however, pedestrian traffic can be observed near the southern trailhead to the Sawyer Camp Trail at the intersection of Skyline Boulevard and Crystal Springs Road.

5.6.1.2 Air Transportation

There are five airports within the Bay Area; however, no airports are located within two miles of the project sites. The nearest public airport is the San Carlos Airport, which is located approximately six miles southeast of the LCSD and four miles east of Sampling Station #5.

5.6.1.3 Parking

On-street parking is not provided along Crystal Springs Road or Skyline Boulevard in the vicinity of the LCSD site. Drivers parking on these roadways pull off the pavement and park in the shoulder area. There are two roadside parking areas in the project area, including one for visitors to the vista point just north of the LCSD (accommodating about 11 vehicles) and one at the Sawyer Camp Trail trailhead on Skyline Boulevard near the intersection with Crystal Springs Road (17 diagonal spaces are striped, including two spaces that meet Americans with Disabilities Act requirements). Informal overflow vehicle parking is common along the shoulders of Crystal Springs Road and Skyline Boulevard near the trailhead. On weekday afternoons, between 50 and 80 vehicles were observed parked along Skyline Boulevard and Crystal Springs Road and in the off-street parking area at the vista point, while on weekend afternoons the number of parked vehicles increased to between 60 and 130 vehicles (LCW Consulting, 2009b).

Public on-street parking is not permitted on Cañada Road in the vicinity of Sampling Station #5. The closest public parking area to the project site is the parking lot for the Pulgas Water Temple. This lot contains approximately 50 to 55 parking spaces, including disabled-accessible spaces. SFPUC employees currently use the staging area adjacent to the Pulgas Discharge Channel for parking maintenance trucks, but this area is not open to the public. There are some roadside parking areas in the vicinity of the intersection of Cañada Road and Edgewood Road for the nearby recreational uses, including Bicycle Sundays, as described above.

5.6.2 Regulatory Framework

5.6.2.1 Federal Regulations

There are no federal regulations that address transportation impacts associated with the proposed project.

5.6.2.2 State and Local Regulations

Transportation analysis in California is guided by policies and standards set at the state level by Caltrans, as well as by local jurisdictions. Jurisdictions regulate speed limits and other driving standards on local roadways. Caltrans and local jurisdictions generally assess the impacts of long-term, not short-term, traffic conditions.

Plans and policies related to transportation aim to prepare for future growth and the vehicular, transit, pedestrian, and bicycle travel demand associated with that growth. Policies regarding roadway service levels apply to long-term, not short-term, traffic conditions. These policies generally specify that roadways maintain a minimum level of service (LOS)[2] on major streets during the peak periods of traffic flow and require the implementation of mitigation measures when project-specific impacts would result in an LOS that exceeds the threshold.

San Mateo County

The LOS standards for roadways are included in the San Mateo County Congestion Management Program (CMP) network and vary by roadway segment; these standards do not apply to impacts resulting from temporary construction projects. Skyline Boulevard, Crystal Springs Road, and Cañada Road in the vicinity of the project sites are not part of the San Mateo County CMP network; however, Skyline Boulevard between Bunker Hill Drive and Highway 92 is part of Highway 35, which is part of the CMP network. The 2007 CMP level of service for this segment of Highway 35 is LOS A, while the established LOS standard is LOS B (C/CAG of San Mateo County, 2007).

5.6.3 Impacts and Mitigation Measures

5.6.3.1 Significance Criteria

The City and County of San Francisco (CCSF) has not formally adopted significance standards for impacts related to traffic, transportation, and circulation, but generally considers that implementation of the proposed project would have a significant impact if it were to:

- Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume-to-capacity ratio on roads, or congestion at intersections);
- Exceed, either individually or cumulatively, an LOS standard established by the county congestion management agency for designated roads or highways (unless it is practical to achieve the standard through increased use of alternative transportation modes);
- Result in a change in air traffic patterns, including either an increase in traffic levels, obstructions to flight, or a change in location, that causes substantial safety risks;
- Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses;
- Result in inadequate emergency access;
- Result in inadequate parking capacity that could not be accommodated by alternative solutions; or
- Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., conflict with policies promoting bus turnouts, bicycle racks, etc.), or cause a substantial increase in transit demand that cannot be accommodated by existing or proposed transit capacity or alternative travel modes.

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[2] LOS is a measure of effectiveness used to determine the quality of service provided by transportation infrastructure. There are six service levels, ranging from LOS A as the best operating condition (free-flow conditions with limited travel delays) to LOS F as the worst-case (congested or overloaded conditions with extremely long delays).

Based on the nature of the proposed project, there would be no impacts related to the following topics:

> _Exceed an LOS Standard._ The LOS standards established by county congestion management agencies and documented in congestion management plans are intended to regulate long-term traffic impacts due to future development and do not apply to temporary construction projects. The LCSDI project would require periodic operations review and maintenance, similar to existing conditions, and project operations would not result in a change in vehicle trips over current practices. Because the LCSDI project would not result in long-term impacts on the roadways used to access the LCSD and Sampling Station #5, no further consideration of LOS impacts on CMP roadways during operation of the project is necessary. Therefore, this significance criterion is not applicable to the project's operational phase and is not discussed further under operational impacts.
>
> _Change Air Traffic Patterns._ Due to the nature and scope of the LCSDI project, implementation of the project would not have the potential to change air traffic patterns at any airport in the area. The project would not involve the installation of structures that could interfere with air space. Therefore, this significance criterion is not applicable and is not discussed further.
>
> _Increase Hazards due to a Design Feature._ Implementation of the LCSDI project would not permanently change the existing or planned transportation network in the affected jurisdictions and would not include any design features that would increase the potential for traffic safety hazards. Therefore, this significance criterion is not applicable to the project's operational phase and is not discussed further under operational impacts.
>
> _Conflict with Adopted Policies, Plans, or Programs Supporting Alternative Transportation._ Implementation of the LCSDI project would not permanently change the existing or planned transportation network in the affected jurisdictions in San Mateo County and therefore would not conflict with policies, plans, or programs related to transit, bicycle, or pedestrian travel. When the project is completed, operations and maintenance activities are expected to be similar to existing conditions and would not result in long-term increases in transit demand. Therefore, this significance criterion is not applicable and is not discussed further.

5.6.3.2 Approach to Analysis

This assessment evaluates the potential for temporary impacts on roadways resulting from construction-related changes in roadway capacities or construction-related traffic increases, as well as long-term impacts resulting from operation of the proposed project.

As described in Chapter 3, Project Description, LCSDI project construction is estimated to take up to 14 months, with the majority of the work occurring in 9 months, including periods with 24-hour-per-day, 7-day-per-week construction. Work is scheduled to begin in the early spring of 2011, with substantial project completion by the end of that year. Although actual work hours would vary depending on the construction phase and the nature of the construction activities, work would be performed in three shifts at least part of the time. The day shift would typically extend from about 6 a.m. to 2 p.m., the swing shift from about 2 p.m. to 10 p.m., and the night shift from about 10 p.m. to 6 a.m. Day shift work would continue for the duration of the project, and swing and night shift work would occur as necessary. In the vicinity of the LCSD site, the

SFPUC has identified nine construction staging areas for parking, equipment staging, spoils storage, laydown, and office uses, which would be located within established work areas at the top and toe of the LCSD, and at the Lower Crystal Springs Dam boat ramp (see Figures 3-7a and 3-7b, in Chapter 3, Project Description).

Haul routes to the LCSD site include I-280, Highway 92, Skyline Boulevard, Polhemus Road, and Crystal Springs Road. Construction vehicles would use Skyline Boulevard and Crystal Springs Road to access the construction area, and existing roads within the established work area would be used to access the staging areas. Haul routes would include: (1) I-280 to Hayne Road to Skyline Boulevard to Crystal Springs Road (toe or top of dam accessible from this route); (2) I-280 to Bunker Hill Drive to Skyline Boulevard to south end of the top of the dam; and (3) I-280 to Highway 92 to Polhemus Road to Crystal Springs Road. Larger trucks would need to use the third route because of turning-radius limitations when these trucks turn right from Crystal Springs Road into the site access road at the toe of the dam. As described in Chapter 3, Project Description, within the established work area, there would also be an approximately 200-foot-long temporary access road constructed at the toe of dam between the existing non-public access road near the Crystal Springs Pump Station and the site of the proposed stilling basin. Vehicles accessing Sampling Station #5 would use I-280, Cañada Road, and the Edgewood Road freeway ramps located about 1.5 miles to the south of the site, and existing roads within the established work area near the site.

No construction would occur on Skyline Boulevard outside of the construction area, although Staging Area 8 would be located along 1,000 feet of the Skyline Boulevard roadway just south of the dam, and Staging Area 9 would be located at the Lower Crystal Springs Reservoir boat ramp (see Figures 3-7a and 3-7b). In addition, construction staging or storage areas would not be located along Crystal Springs Road, and no work would be conducted within the Cañada Road right-of-way in the vicinity of the Pulgas Water Temple. Construction vehicle trips would be spread throughout the day, so most vehicles would not travel to or from the project construction area during the peak commute hours.

The impacts from additional construction worker vehicles and haul trucks associated with activities at the LCSD on Skyline Boulevard and Crystal Springs Road were assessed quantitatively, using the operational analysis methodology provided in the *Highway Capacity Manual* (Transportation Research Board, 2000). Both Skyline Boulevard and Crystal Springs Road were analyzed using the LOS methodology for Class II two-lane highways.[3] On two-lane highways, passing slower vehicles requires that drivers use the opposing lane, where sight distance and gaps in the opposing traffic stream permit. As the traffic volumes increase, and when lanes are blocked for any reason, the ability to pass decreases, resulting in the formation of "platoons" (groups of vehicles) in the traffic stream. Motorists in the platoons are subject to delay. The LOS for two-lane highways is based on the ability of motorists to pass slower-moving vehicles and is defined in terms of "percent time spent following" (PTSF)[4] another vehicle. Terrain type, two-way traffic volumes, vehicle type, and percentage of roadway where passing is not permitted are used in calculating roadway LOS. **Table 5.6-4** presents the LOS designation and the PTSF values for each LOS designation.

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[3] As noted in Section 5.5.2.2, Skyline Boulevard, Crystal Springs Road, and Cañada Road in the vicinity of the project sites are not part of the San Mateo County CMP roadway network. In general, operating conditions of LOS A through LOS D are considered acceptable levels of service, and LOS E and LOS F are considered unacceptable levels.

TABLE 5.6-4
LOS CRITERIA FOR TWO-LANE CLASS II HIGHWAYS

Level of Service	Percent Time Spent Following
A	< 40
B	> 40 – 55
C	> 55 – 70
D	> 70 – 85
E	> 85

SOURCE: Transportation Research Board, 2000.

The impacts of construction activities associated with the LCSDI project were also assessed quantitatively at the unsignalized intersections of Skyline Boulevard/Crystal Springs Road and Polhemus Road/Crystal Springs Road. The study intersections were evaluated using the *Highway Capacity Manual 2000* methodology. For unsignalized intersections where movements are subject to delay, average delay and LOS operating conditions were calculated by approach (e.g., northbound) and movement (e.g., northbound left turn). For the purpose of this analysis, the operating conditions at the four-way stop-sign-controlled intersection of Skyline Boulevard/Crystal Springs Road are presented for overall intersection operations, and the operating conditions at the two-way stop-sign-controlled intersection of Polhemus Road/Crystal Springs Road are presented for the worst-case approach (i.e., the approach with the highest average delay per vehicle) and for overall intersection operations. **Table 5.6-5** presents the LOS designation and the seconds of delay per vehicle for each LOS designation.

TABLE 5.6-5
LOS CRITERIA FOR UNSIGNALIZED INTERSECTIONS

Level of Service	Average Control Delay (seconds per vehicle)
A	< 10.0
B	> 10.0 and ≤ 15.0
C	> 15.0 and ≤ 25.0
D	> 25.0 and ≤ 35.0
E	> 35.0 and ≤ 50.0
F	> 50.0

SOURCE: Transportation Research Board, 2000.

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[4] PTSF is the average percent of total travel time that vehicles must travel in platoons behind slower vehicles because they are unable to pass on a two-lane highway. It therefore represents the freedom to maneuver and convenience of travel.

5.6.3.3 Impact Summary

Table 5.6-6 summarizes the project-related impacts on transportation and circulation described in this section.

TABLE 5.6-6
SUMMARY OF IMPACTS – TRANSPORTATION AND CIRCULATION

Impact	Significance Determination	
	LCSD Site	**Sampling Station Site**
Impact TR-1: Temporary reduction in roadway capacity and increases in traffic delays during construction.	PSM	LS
Impact TR-2: Short-term traffic increases on roadways due to construction-related vehicle trips.	PSM	LS
Impact TR-3: Impaired access to adjacent roadways and land uses.	PSM	LS
Impact TR-4: Temporary displacement of on-street parking at some locations due to increased parking demand or construction within roadways.	LS	LS
Impact TR-5: Increased potential traffic safety hazards for vehicles, bicyclists, and pedestrians on public roadways during construction.	PSM	LS
Impact TR-6: Increases in vehicle trips to and from project facilities for operation and maintenance.	LS	LS
Impact C-TR: Cumulative traffic increases on local and regional roads.	PSM	LS

B = Beneficial impact
N/A = Not Applicable or no impact
LS = Less than Significant impact, no mitigation required
SM = Significant impact, can be Mitigated to less than significant
PSM = Potentially Significant impact, can be Mitigated to less than significant
SU = Significant Unavoidable impact
PSU = Potentially Significant Unavoidable impact

5.6.3.4 Construction Impacts

Impact TR-1: Temporary reduction in roadway capacity and increased traffic delays during construction.

Lower Crystal Springs Dam Vicinity

Project construction would require a nine-month closure of an approximately 1,300-foot segment of Skyline Boulevard between Crystal Springs Road and Bunker Hill Drive to all through-traffic (see Figure 5.6-1). Construction of improvements to the LCSD would not require any temporary lane closures or right-of-way encroachments along Crystal Springs Road.

Traffic Impacts. Skyline Boulevard between Crystal Springs Road and the I-280 southbound off-ramp to Bunker Hill Drive primarily serves recreational traffic and local traffic associated with the residential uses to the northeast and southeast of the LCSD. I-280 parallels Skyline Boulevard along the east side of Lower Crystal Springs Reservoir, and during the temporary construction-related closure of Skyline Boulevard, it is likely that most drivers would either remain on I-280 (rather than exiting and traveling on Skyline Boulevard) or would use I-280 as a detour route to access points north and south of the closure zone. Depending on the direction of travel, drivers would also use alternate exits (i.e., Hayne Road/Skyline Boulevard, Bunker Hill Drive, and Highway 92) to reach their destination. Drivers remaining on Skyline Boulevard would divert to Crystal Springs Road, Polhemus Road, and Bunker Hill Drive. Some drivers would use Highway 92 to access Polhemus Road to the southeast of the road closure. The detour routes and roadways that would be available during construction are shown on **Figure 5.6-2**.

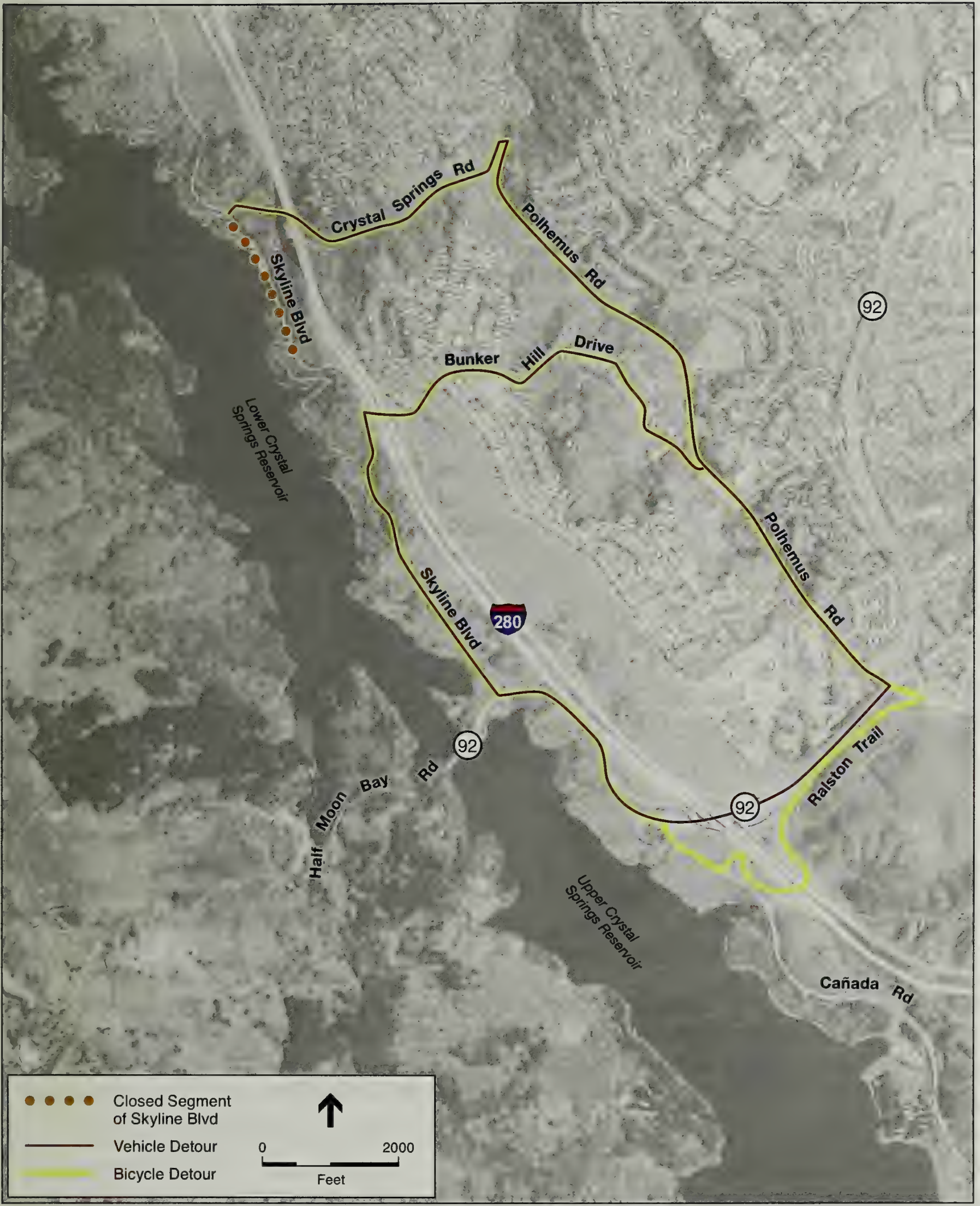
As described in Chapter 3, Project Description, Skyline Boulevard crosses the LCSD at the Skyline Boulevard Bridge, which is located on top of the dam. The bridge is supported on piers mounted on the dam and is owned by San Mateo County. San Mateo County is currently proposing to demolish the bridge and replace it with a new seismically and structurally sound bridge that would be supported over the improved dam. San Mateo County and the SFPUC are coordinating construction planning for the two projects (see Chapter 3, Project Description, Section 3.6.2.1). Since bridge demolition would occur prior to construction of the LCSD improvements, it is assumed that this coordination would include provisions for retaining the detour signage installed by San Mateo County throughout construction of the LCSD improvements as well as during construction of the new bridge.

San Mateo County has identified the following detour routes as part of the Crystal Springs Dam Bridge Replacement project (San Mateo County, 2009):

> *South of the Skyline Boulevard Bridge*. Northbound traffic on Skyline Boulevard would be directed onto Highway 92 (for vehicles) or Bunker Hill Drive (for both vehicles and bicycles). From there, traffic would be directed to northbound Polhemus Road. From Polhemus Road, traffic would be directed west on Crystal Springs Road, where it meets with Skyline Boulevard north of the LCSD construction site. The expected detour length is 5 miles for vehicular traffic using Highway 92, or 3.6 miles for vehicular and bicycle traffic using Bunker Hill Drive.
>
> *North of the Skyline Boulevard Bridge*. Southbound traffic on Skyline Boulevard would be directed eastbound on Crystal Springs Road. From there, traffic would be directed to southbound Polhemus Road. From Polhemus Road, traffic would be directed west on Highway 92 (for vehicles) or Bunker Hill Drive (for both vehicles and bicycles), where it meets with Skyline Boulevard south of the construction site. The expected detour length is 5 miles for vehicular traffic using Highway 92, or 3.6 miles for vehicular and bicycle traffic using Bunker Hill Drive.

In addition, bicycle traffic would have another detour option in lieu of using Bunker Hill Drive, which may be too steep for some bicyclists:

> *Bicycle Traffic Coming from North of the Skyline Boulevard Bridge Via the Terminus of the Sawyer Camp Trail or Skyline Boulevard*. Southbound bicycle traffic on Skyline Boulevard or the Sawyer Camp Trail would be directed east onto Crystal Springs Road. From there, bicycle traffic would be directed southbound onto Polhemus Road, which then becomes Ralston Avenue near the Highway 92 interchange. Immediately south of the Ralston Avenue/ Highway 92 interchange, bicycle traffic would be directed west onto the Ralston Trail



SOURCE: ENTRIX, Inc., 2008; ESA + Orion, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.6-2
Proposed Vehicle and Bicycle Detours

(a 1-mile-long paved recreational trail), which runs parallel to Highway 92 and connects to Cañada Road via a bicycle/pedestrian bridge that crosses over I-280 south of the construction site. The total bicycle traffic detour length is 4 miles. The 4-mile-long bicycle traffic detour would require bicyclists to travel an additional 1.5 miles in order to connect to Cañada Road compared to the 2.5-mile distance to reach Cañada Road if Skyline Boulevard were not closed.

Bicycle Traffic Coming from South of the Skyline Boulevard Bridge from Highway 92. Bicycle traffic traveling in an easterly direction on Highway 92 would have the option to either travel northbound on Skyline Boulevard from the signalized intersection of Highway 92/Skyline Boulevard and continue northbound towards the Bunker Hill Drive detour, which connects to Polhemus Road, or have the option to continue easterly on Highway 92 and then travel southbound on Cañada Road to connect to the Ralston Trail detour described above (i.e., the detour will require bicyclists to travel eastbound on the Ralston Trail, northbound on Ralston Avenue and Polhemus Road, and westbound on Crystal Springs Road to connect with Skyline Boulevard at the Sawyer Camp Trail).

Traffic volume data collected in June 2009 indicate that about 1,300 vehicles per day travel on Skyline Boulevard south of Crystal Springs Road (about 600 vehicles in each direction) (CHS Consulting, 2009). If all traffic were temporarily diverted to I-280, which has four travel lanes in each direction, this volume would represent a maximum of 1 percent of the existing traffic volume, which is not a substantial increase relative to the capacity of the roadway. Other local roadways carry between 1,300 and 2,000 vehicles per day, and existing peak-hour volumes range between 90 and 500 vehicles per hour. Even if all of the traffic from Skyline Boulevard were routed to these other roadways (instead of vehicles remaining or using I-280), the addition of up to 120 vehicles per hour (the p.m. peak-hour volume) would not substantially increase travel delays at this location relative to the existing volumes and hourly capacities. See Impact TR-2 below for a quantitative analysis of diverted traffic and project-generated traffic.

Since construction activities associated with the LCSDI would require the temporary closure of Skyline Boulevard and implementation of traffic detour routes, the traffic impact related to the associated reduction in roadway capacity would be *potentially significant*. However, implementation of Mitigation Measure M-TR-1 (Traffic Control Plan), which would require the contractor to post traffic detour signs notifying drivers in the area of the roadway closure, would reduce this impact to a less-than-significant level.

Section 5.6.3.7, Cumulative Impacts, below, presents a discussion of the cumulative impact associated with the extended closure of Skyline Boulevard under the LCSDI and the San Mateo County Crystal Springs Dam Bridge Replacement projects, as well as the cumulative impacts related to other SFPUC and other non-SFPUC planned or approved projects.

Bicycle Impacts. The closure of Skyline Boulevard at the LCSD site for the 14-month duration of project construction would result in impacts on bicyclists in the project area. Bicyclists might elect to travel on other recreational bicycle routes (e.g., Cañada Road south of Highway 92) or could divert to other roadways to bypass the closed section of Skyline Boulevard (e.g., Crystal Springs Road, Polhemus Road, and Bunker Hill Drive).

As described above, San Mateo County would demolish the Skyline Boulevard Bridge prior to construction of the LCSD project improvements and would be responsible for implementing traffic and bicycle detour routes. The traffic and bicycle detour routes described above and associated signage would be applicable to the LCSDI project, and are included in Mitigation Measure M-TR-1 (Traffic Control Plan).

Since construction activities would require the temporary closure of Skyline Boulevard and implementation of traffic and bicycle detour routes, the traffic impact related to the reduction in roadway capacity on bicyclists would be *potentially significant*. However, implementation of Mitigation Measure M-TR-1 (Traffic Control Plan), which would require the contractor to post traffic and bicycle detour signs notifying drivers and users of recreational facilities in the area of the roadway closure and alternate bicycle routes, would reduce this impact to a less-than-significant level.

Emergency Service Impacts. During construction, the SFPUC and its contractors would have continued but limited access to the closed portion of Skyline Boulevard from both the north and south ends of the LCSD project construction area. Temporary closure of Skyline Boulevard would affect the ability of emergency service providers to access land uses in the LCSD vicinity, particular recreational land uses, as well as to access the construction site in the event emergency service is needed.

Since construction activities would require the temporary closure of Skyline Boulevard and implementation of traffic detour routes, the traffic impact related to access for emergency service providers would be *potentially significant*. However, implementation of Mitigation Measure M-TR-1 (Traffic Control Plan), which would require the SFPUC to provide advanced information and notification to emergency service providers regarding the road closure and alternate routes to residential and recreational land uses in the LCSD vicinity, would reduce this impact to a less-than-significant level. Depending on the emergency service provider, uses to the north of the closed portion of Skyline Boulevard could use I-280 (Hayne Road interchange), Skyline Boulevard, Crystal Springs Road, and Polhemus Road. For uses south of the closed portion of Skyline Boulevard, emergency service providers could use I-280 (Bunker Hill Drive interchange), Highway 92, and Skyline Boulevard.

Sampling Station #5 Vicinity

The proposed raising of Sampling Station #5 would be conducted within an established, off-street work area and would not involve construction within the Cañada Road right-of-way. Staging areas would also be located within an established, off-street work area. Construction activities would not result in any temporary lane closures on Cañada Road, and impacts on roadway capacity would therefore be *less than significant*. No mitigation is required.

Impact TR-2: Short-term traffic increases on roadways due to construction-related vehicle trips.

Lower Crystal Springs Dam Vicinity

Traffic Impacts. Construction traffic would result in short-term increases in traffic volumes on roadways in the immediate vicinity of the LCSD and along haul routes. Adding construction vehicle traffic to the existing roadway volumes, without increasing the capacity of the roadway, could result in increased congestion and delays for vehicles. The presence of construction truck traffic would temporarily reduce roadway capacities due to the slower travel speeds and larger turning radii of trucks. The impacts of construction traffic would be most noticeable in the immediate project area and less noticeable farther away and on regional facilities.

Construction-related vehicle trips would include construction workers traveling to and from the project construction area, and haul truck trips associated with material deliveries and waste disposal. The number of construction-related vehicles traveling to and from the project construction area would vary on a daily basis depending on the construction phase, planned activity, and materials needs.

Table 5.6-7 presents the number of vehicles associated with construction workers and haul and delivery trucks by shift and on a daily basis; it also shows the number of construction vehicle trips that would occur in the LCSD vicinity on an hourly basis. On a daily basis, assuming construction work during all three shifts, the maximum number of construction vehicles traveling to the site would be 247 vehicles (up to 135 construction worker vehicles and 112 trucks). Construction truck trips to and from the LCSD site would be distributed throughout the day and would average about 16 truck trips per hour (8 inbound and 8 outbound) when offsite disposal and concrete deliveries overlap, which could occur for up to two months. This assumption is conservative because, due to the limited site access, it is not likely that the construction contractor would schedule offsite disposal and concrete deliveries in the same day. In addition to the construction trucks, workers would travel to and from the site on a daily basis and would travel prior to and following their work shifts. Depending on the construction phase, and assuming that all workers would drive to the project work area in their own vehicles, these workers would generate between 40 and 90 vehicle trips per shift. This is also a conservative assumption because some workers might carpool, and arrivals and departures could be spread over a longer period.

Crystal Springs Road would provide access to the onsite spoils storage area at the toe of the dam via an existing SFPUC access road to the work area. This access road is currently gated and is about 12 feet wide (with unpaved shoulders). At the intersection of the access road with Crystal Springs Road, the access road approach is flared to accommodate truck turns to and from eastbound and westbound Crystal Springs Road. Due to the tight turning radius, the SFPUC has indicated that larger trucks would be directed to access the site from Crystal Springs Road westbound, and therefore larger trucks would turn left from Crystal Springs Road westbound to access the site and would turn right from the project site onto Crystal Springs Road eastbound.

TABLE 5.6-7
DAILY CONSTRUCTION VEHICLES AND HOURLY CONSTRUCTION VEHICLE TRIPS AT THE LCSD SITE

	Daily Number of Construction Vehicles				**Maximum Hourly Construction Vehicle Trips (Inbound and Outbound)**		
	Shift[a]			**Maximum Daily Total**			
Description	**Day**	**Swing**	**Night**		**Inbound**	**Outbound**	**Total**
Construction Workers[b]	45	45	45	135	45	45	90
Construction Trucks							
Offsite Material Disposal	10	0	0	10	2	2	4
Miscellaneous Deliveries	4	4	4	12	2	2	4
Concrete Deliveries	30	30	30	90	4	4	8
Total Construction Trucks	44	34	34	112	8	8	16
Total Trips	**89**	**79**	**79**	**247**			

[a] Day shift between 6 a.m. and 2 p.m.; swing shift between 2 p.m. and 10 p.m.; and night shift between 10 p.m. and 6 a.m.

[b] The number of onsite construction workers would range between 20 to 45, depending on construction activities. Construction worker trips would generally occur one hour before the start of a shift (inbound) and one hour after a shift (outbound).

SOURCES: SFPUC, 2009; LCW Consulting, 2009c.

Larger trucks turning into and out of the project construction area access road could constrain traffic operations on Crystal Springs Road if more than one movement is required to turn into or out of the access road. In this situation, it might be necessary to periodically stop traffic on Crystal Springs Road for several minutes at a time throughout the day to accommodate turning trucks. As indicated above, the approach of the access road to Crystal Springs Road has been widened as part of previous construction activities on the site to facilitate turn maneuvers by trucks.

Haul trucks for offsite disposal of excavated materials would use a combination of regional routes (e.g., I-280 and Highway 92) and local arterials and roadways, depending on the disposal site location. Nonhazardous spoils would likely be disposed of at the Allied Waste Ox Mountain Sanitary Landfill in Half Moon Bay, accessed via Skyline Boulevard, I-280, and Highway 92. Construction workers would primarily use Skyline Boulevard and Crystal Springs Road to access the project construction area, and workers would use the designated worker parking areas within the established work area (i.e., at Staging Areas 6 and 8, shown on Figures 3-6 and 3-7a in Chapter 3, Project Description).

Roadway segment operating conditions for Skyline Boulevard and Crystal Springs Road in the LCSD vicinity, and intersection LOS operating conditions at Skyline Boulevard/Crystal Springs Road and Polhemus Road/Crystal Springs Road were calculated for a.m. and p.m. peak-hour conditions without and with the project trips. The LOS analysis assumes the closure of Skyline Boulevard, which would reroute vehicles to other local roadways, including Crystal Springs Road, Bunker Hill Drive, and Polhemus Road (a conservative assumption, as some drivers would use I-280 to access their destination), as well as the addition of 16 construction truck trips (excavation haul and concrete delivery) and 45 construction worker trips (a conservative assumption that half of construction worker inbound and outbound trips would occur during the a.m. and p.m. peak hours).

Table 5.6-8 presents the hourly traffic volumes (in both directions), PTSF, and LOS designation for existing conditions, and for conditions with the additional construction worker and truck trips on Skyline Boulevard between Golf Course Road and Crystal Springs Road, and on Crystal Springs Road between Skyline Boulevard and Polhemus Road. As indicated in Table 5.6-8, the addition of the project-generated vehicles would not substantially affect the existing operating conditions on Skyline Boulevard or Crystal Springs Road, and the operating conditions would remain at acceptable levels (i.e., at LOS D or better). Individual drivers on Crystal Springs Road and Skyline Boulevard, however, would experience intermittent delays, particularly while traveling behind construction trucks. The impact on other local roadways (such as Bunker Hill Drive) that might be used by construction workers to access the site would be comparatively less due to the lower existing traffic volumes, and because the number of project-generated vehicle trips using a particular section of roadway during the peak hour would be less.

TABLE 5.6-8
LOS OPERATING CONDITIONS ON SKYLINE BOULEVARD AND CRYSTAL SPRINGS ROAD
WEEKDAY AM AND PM PEAK HOURS

	Existing Conditions			Existing Plus Project Conditions		
Location	**Volume**	**PTSF[c]**	**LOS**	**Volume**	**PTSF**	**LOS**
AM Peak Hour						
Skyline Boulevard[a]	311	36.3%	A	364	41.0%	B
Crystal Springs Road[b]	250	30.3%	A	303	35.6%	A
PM Peak Hour						
Skyline Boulevard	320	37.1%	A	379	36.3%	A
Crystal Springs Road	210	26.3%	A	318	58.8%	C

[a] Skyline Boulevard between Hayne/Golf Course Road and Crystal Springs Road.
[b] Crystal Springs Road between Skyline Boulevard and Polhemus Road.
[c] PTSF (Percent Time Spent Following) is the average percent of total travel time that vehicles must travel behind slower vehicles due to the inability to pass on a two-lane highway. It therefore represents the freedom to maneuver and convenience of travel. LOS criteria for two-lane highways are based on both PTSF and average speed.

SOURCE: LCW Consulting, 2009c.

Table 5.6-9 presents the results of the LOS analysis at the nearby intersections of Skyline Boulevard/Crystal Springs Road and Polhemus/Crystal Springs Road for the weekday a.m. and p.m. peak hours for both existing and existing-plus-project conditions. As noted above, the LOS analysis for the existing-plus-project condition includes the rerouting of vehicles currently using the portion of Skyline Boulevard that would be closed to through-traffic. As indicated in

Table 5.6-9, with the addition of project vehicle trips and rerouting of traffic volumes due to the Skyline Boulevard road closure, average delay would increase minimally; intersection operations would not substantially change, and the operating conditions would remain at acceptable levels (i.e., LOS D or better).

TABLE 5.6-9
LOS OPERATING CONDITIONS AT NEARBY INTERSECTIONS
WEEKDAY AM AND PM PEAK HOURS

	Existing Conditions		Existing Plus Project Conditions	
Location	**Delay**[a]	**LOS**	**Delay**[a]	**LOS**
AM Peak Hour				
Skyline Boulevard/Crystal Springs Road	8.0	A	8.1	A
Polhemus Road/Crystal Springs Road[b]	4.4 [14.5]	B	4.5 [16.9]	C
PM Peak Hour				
Skyline Boulevard/Crystal Springs Road	8.0	A	8.2	A
Polhemus Road/Crystal Springs Road[b]	3.0 [12.0]	B	3.1 [13.6]	C

[a] Average delay per vehicle – seconds per vehicle
[b] 4.4 [14.5] = overall intersection delay [worst-case approach delay]. LOS presented for worst-case approach.

SOURCE: LCW Consulting, 2009.

As described above, during the weekday peak hours, the additional vehicles and reroutes would not substantially affect intersection operations. Therefore, the impact of construction activities on traffic operations on Skyline Boulevard and Crystal Springs Road, and at the intersections of Skyline Boulevard/Crystal Springs Road and Polhemus Road/Crystal Springs Road would be *less than significant*. No mitigation is required.

Transit Impacts. Since there are no transit routes on Crystal Springs Road or Skyline Boulevard, project construction activities would not affect any transit operations.

Bicycle Impacts. Additional project-generated construction trucks and construction worker vehicles would potentially affect bicycle travel on Skyline Boulevard and Crystal Springs Road, as bicyclists share the travel lane with vehicles. Due to the relatively low volume of bicyclists on weekdays (when construction activities would occur), the diversion of vehicles from Skyline Boulevard to other roads, and the limited number of project-related vehicle trips, LCSDI construction activities would not substantially affect bicycle conditions on weekdays. However, on weekends (when bicycle travel is greater), the potential for conflicts resulting from increased truck traffic on Crystal Springs Road would be greater, and the effects of short-term traffic increases on bicycle operations would be *potentially significant*. Implementation of Mitigation Measure M-TR-1 (Traffic Control Plan), which would require the contractor to post traffic and bicycle detour signs notifying drivers and users of nearby recreational facilities of the roadway closure and alternate bicycle routes, and to limit the hauling of excavated materials to weekdays, would reduce this impact to a less-than-significant level.

Sampling Station #5 Vicinity

Construction-related vehicle trips associated with raising Sampling Station #5 would include workers traveling to and from the project work area, as well as haul truck trips associated with excavated material disposal and concrete deliveries. The number of construction-related vehicles traveling to and from the work area would vary on a daily basis depending on the construction phase, planned activity, and materials needs. Construction vehicle trips to and from the project work areas would be distributed throughout the day, although construction workers would travel before and after their work shift (assumed to be one shift per day, typically between 7:00 a.m. and 5:00 p.m.). On a daily basis, the maximum number of construction vehicles (trucks and worker vehicles) traveling to and from the site would be about 10 (3 haul and delivery vehicles, and 7 construction worker vehicles). Therefore, there would be about 20 daily construction vehicle trips (10 inbound to the site and 10 outbound from the site) during the construction period.

The percent increase in daily traffic volumes resulting from construction traffic on Cañada Road, Edgewood Road, and I-280 serving the project site would not be substantial relative to the background traffic volumes (less than 1 percent of existing traffic volumes), nor would the project traffic substantially disrupt traffic flows on the local roadways. The percent increase in daily traffic volumes on local roadways would be greater because local roadways near the project site are mostly rural roadways with low traffic volumes. However, even with construction-related traffic, the percent increase would not be substantial relative to the background traffic volumes (an increase of generally less than 1 percent of existing traffic volumes), and traffic volumes would remain at levels that are less than the carrying capacity of the local roadways. Therefore, the effects of short-term traffic increases at the Sampling Station #5 site would be *less than significant*, and no mitigation is required.

Impact TR-3: Impaired access to adjacent roadways and land uses.

Lower Crystal Springs Dam Vicinity

Construction activities associated with project improvements would generally be conducted in the established off-street work area within the SFPUC's right-of-way. While improvements would require the closure of Skyline Boulevard and use of about 1,000 feet of Skyline Boulevard south of the dam for a staging area, this section of roadway does not provide access to residential or recreational uses. However, construction activities would affect the ability of emergency service providers to access land uses in the LCSD vicinity, particularly recreational land uses at the south end of the Sawyer Camp Trail.

Since construction activities would temporarily increase congestion in the immediate vicinity of the LCSD and require closure of a portion of Skyline Boulevard, the impact related to impaired access and emergency access would be *potentially significant*. However, implementation of Mitigation Measure M-TR-1 (Traffic Control Plan), which would require the SFPUC to provide advanced information and notification to emergency service providers regarding the road closure, to identify alternate routes to residential and recreational land uses in the LCSD vicinity, and to ensure to emergency access to the closed sections of Skyline Boulevard, would reduce this impact to a less-than-significant level.

Sampling Station #5 Vicinity

Construction activities associated with project improvements would be conducted in the established off-street work area within the SFPUC right-of-way and would not involve construction within public roadways outside of the work areas, which could affect access to adjacent uses or access for emergency responders. Construction activities associated with the improvements would not involve any temporary road closures and therefore would not affect the ability of emergency vehicles to access adjacent land uses. As a result, impacts related to impaired access and emergency access at the Sampling Station #5 site would be *less than significant*, and no mitigation is required.

Impact TR-4: Temporary displacement of on-street parking at some locations due to increased parking demand or construction within roadways.

Lower Crystal Springs Dam Vicinity

Project construction activities would result in a worker parking demand that would vary depending on the construction phase. Assuming that construction workers drive to the project area alone in their own vehicles (i.e., they do not carpool), worker parking demand would range between 20 and 45 vehicles. The established work area would include two staging areas (Staging Areas 6 and 8) for construction worker parking, which would accommodate the projected demand. The majority of construction workers would park within Staging Area 8, which includes about 300 feet of Skyline Boulevard south of the dam. This area would be used to stage materials and equipment, but would also accommodate vehicle parking.

The Sawyer Camp Trail, north of the intersection of Skyline Boulevard and Crystal Springs Road, would remain open during construction. With the exception of the roadside parking area at the vista point for the LCSD (which would be closed to the public and used as a staging area during construction), project construction activities would not affect the off-road parking at the trailhead and along the shoulders of Skyline Boulevard and Crystal Springs Road for users of the trail. The vista point parking area currently accommodates about 11 vehicles and is frequently used, particularly on weekends. It is expected that vehicles would instead use spaces on the shoulder of Skyline Boulevard and Crystal Springs Road to make up for the loss of these 11 parking spots. The addition of up to 11 vehicles parking along the shoulder of Skyline Boulevard and Crystal

Springs Road would not substantially change parking conditions in the area, and thus the impact of parking space displacement would be *less than significant*, and no mitigation is required. Impacts on recreational users due to temporary loss of parking at the vista point are described in Section 5.10, Recreation.

Although impacts related to the temporary displacement of parking would be less than significant, implementation of Mitigation Measure M-TR-1 (Traffic Control Plan), required as part of Impact TR-1, would include measures requiring that construction workers park within the established work areas and not on the shoulders of Skyline Drive or Crystal Springs Road. This measure would minimize the effect of construction on areawide parking conditions.

Sampling Station #5 Vicinity

Project construction would occur within an off-street work area; therefore, construction would not displace any on-street parking near the project site. The onsite construction staging areas would accommodate contractor staging, loading, and parking areas. The staging area would accommodate the estimated demand for seven construction worker vehicles on the site each day. The impact on parking would therefore be *less than significant*, and no mitigation is required.

Impact TR-5: Increased potential traffic safety hazards for vehicles, bicyclists, and pedestrians on public roadways during construction.

Lower Crystal Springs Dam Vicinity

Since construction activities can temporarily suspend the normal functions of roadways, the potential exists for an increase in traffic safety hazards during construction of the project. This increase in safety hazards would be due to the increased potential for:

- Conflicts between construction vehicles (with slower speeds and wider turning radii than autos) and autos, bicyclists, and pedestrians using the roadways
- Conflicts between the movement of traffic and construction activities, particularly where construction traffic would access travel lanes adjacent to the work zone
- Confusion of drivers at the location of roadway closures (e.g., at the intersection of Skyline Boulevard and Crystal Springs Road)
- Confusion of bicyclists and pedestrians due to temporary alterations to bicycle and pedestrian circulation

Construction vehicles transporting excavated materials to offsite locations and delivering equipment and supplies (e.g., concrete, clean fill, etc.) would share the area roadways with other vehicles, with the greatest number of daily truck trips projected to travel along Crystal Springs Road, Skyline Drive, Polhemus Road, and Cañada Road. Project-related use of Polhemus Road and Crystal Springs Road could potentially increase safety hazards for drivers in the area of Odyssey School at the intersection of Crystal Springs Road and Polhemus Road.

In general, construction contractors for any projects affecting the public right-of-way (e.g., roadways, sidewalks, and walkways) would be required to provide for continuity of vehicular, pedestrian, and bicyclist traffic; reduce the potential for traffic accidents; and ensure worker safety in construction zones. Where work zone activities could disrupt mobility and access for bicyclists and pedestrians, safe and convenient access would need to be maintained. The increase in traffic safety hazards during construction of the proposed project at the LCSD site would be a *potentially significant* impact.

To avoid potential traffic safety hazards during construction at the LCSD site, Mitigation Measure M-TR-1 (Traffic Control Plan) would require that the SFPUC or its contractors prepare and implement a traffic control plan that includes provisions such as: installation of signs warning motorists, bicyclists, and pedestrians of the construction zones; notification of detour routes for vehicles and alternate routes for bicyclists; and use of flaggers, illuminated signs, temporary stoplights, flashing yellow lights, or a combination of these to slow approaching traffic at project access points to reduce traffic hazards during construction. Implementation of Mitigation Measure M-TR-1 would reduce potential safety impacts to a less-than-significant level.

Sampling Station #5 Vicinity

At the Sampling Station #5 site, construction activities would be limited to areas within the CCSF-owned lands where there is no public access, and, as described above under Impact TR-2, there would be about 20 construction vehicle trips during the four-month construction period. This limited and short-term increase in traffic would result in a minimal increase in traffic safety hazards, and the impact would be *less than significant.* No mitigation is required.

5.6.3.5 Operational Impacts

Impact TR-6: Increases in vehicle trips to and from project facilities for operation and maintenance.

Lower Crystal Springs Dam and Sampling Station #5 Vicinities

After project construction is completed, the LCSD and Sampling Station #5 would require periodic operational inspection and maintenance activities, similar to existing operations, and would not generate a significant number of new vehicle trips. Overall, any increases in traffic generated by operation and maintenance of the LCSD and Sampling Station #5 would be negligible compared to existing conditions and would not result in a noticeable increase in traffic on adjacent streets. Therefore, long-term operational impacts of the proposed project would be *less than significant,* and no mitigation is required.

5.6.3.6 Mitigation Measures

Mitigation Measure M-TR-1: Traffic Control Plan.

The SFPUC shall ensure that the contractor prepares and successfully implements a traffic control plan. The traffic control plan shall include appropriate project-specific measures, including measures to reduce potential impacts related to traffic flows on roadways affected by project construction activities. The SFPUC and construction contractor(s) shall also coordinate with local jurisdictions and Caltrans, as appropriate, for affected roadways and intersections. The traffic control plan shall include, but not necessarily be limited to, the elements listed below. In no case, however, will the traffic control plan contain elements that are inconsistent with traffic safety recommendations by agencies with jurisdiction over roadways in the project area (e.g., San Mateo County or Caltrans).

- The SFPUC shall coordinate with San Mateo County on traffic and bicycle detours developed as part of the Crystal Springs Dam Bridge Replacement project to ensure that throughout construction of the LCSDI project, the detours remain accessible for motorists and bicyclists and that adequate signage and notification of the detours are maintained.

- The SFPUC shall notify all emergency service providers in advance of construction to inform them of the construction activities, road closures, and detours.

- Circulation and detour plans shall minimize impacts on local street circulation. Haul routes that minimize truck traffic on local roadways and residential streets shall be utilized to the extent feasible. As necessary, flaggers and/or signage shall be used to guide vehicles at project access points.

- Haul trucks shall be restricted from using Bunker Hill Drive between the I-280 ramps and Polhemus Road to avoid potential conflicts with bicyclists, except in the event that other access to Skyline Boulevard and the LCSD is not available.

- The construction contractor shall be responsible for keeping the pavement clean from debris, spills, etc. from haul trucks on Skyline Boulevard and Crystal Springs Road in the vicinity of the LCSD site access road. At a minimum, Skyline Boulevard and Crystal Springs Road shall be swept clean twice a week (e.g., at a minimum, the roads shall be swept at the end of the workday on Friday to maintain clean pavement for Saturday morning bicyclists).

- A public information program shall be developed and implemented to advise motorists, bicyclists, nearby residents, and adjacent commercial establishments of the impending construction activities (e.g., media coverage, direct distribution of flyers to affected properties, email notices, portable message signs, and informational signs at the job sites).

- Detour signs shall be posted for bicycles and pedestrians in the vicinity of the Skyline Boulevard roadway closure to notify bicyclists and pedestrians of alternative routes.

- Signage shall be posted at the LCSD vista point and southern Sawyer Camp Trail trailhead to notify recreationists of alternative parking areas that would remain available during project construction activities.

- When feasible, truck trips on Crystal Springs Road and Polhemus Road shall be avoided during the school drop-off and pickup hours for the Odyssey School. When infeasible, additional flaggers shall be provided during school drop-off and pickup hours near the intersection of Crystal Springs Road and Polhemus Road to manage traffic flow and maintain traffic safety. The construction contractor shall confirm the start and dismissal times prior to the beginning of each school year.

- All equipment and materials shall be stored in designated contractor staging areas.

- Locations shall be identified for construction worker parking within the construction zone or, if necessary, at a nearby location where transport would be provided between the parking location and the worksite. Construction workers shall not be permitted to park along Crystal Springs Road or Skyline Boulevard within the vicinity of the Sawyer Camp Trail trailhead.

- In conjunction with San Mateo County, the SFPUC shall provide advanced information to emergency service providers regarding the closure of Skyline Boulevard and shall notify emergency service providers of traffic and bicycle detour routes prior to the start of construction. The SFPUC shall provide regular updates on planned construction activities and schedule. If necessary, the SFPUC shall provide access to emergency service providers to the closed portions of Skyline Boulevard from both the north and south ends of the project construction area.

- Roadside safety protocols shall be implemented such as "Road Work Ahead" warning signs and speed controls to achieve required speed reductions for safe traffic flow through the work zone.

- Roadway rights-of-way shall be repaired or restored to their preconstruction conditions upon the completion of construction.

- To the extent applicable, the traffic control plan shall conform to the *California Manual on Uniform Traffic Control Devices for Streets and Highways: Part 6 Temporary Traffic Control* (Caltrans, 2006).

5.6.3.7 Cumulative Impacts

Impact C-TR: Cumulative traffic increases on local and regional roads.

The geographic scope of cumulative traffic impacts includes the local and regional roadways and highways that would be used for LCSDI construction activities and for access by construction workers and vehicles. Construction of the LCSDI project is scheduled to begin in early 2011 and to be completed by spring of the following year. As indicated in Figures 5.1-1 and 5.1-2, construction of the LCSDI would occur within the same vicinity and timeframe as other planned and proposed SFPUC projects as well as other public and private projects. Construction activities at the LCSD and Sampling Station #5 sites would contribute incrementally to cumulative traffic increases from a number of other projects in the area that could be under construction at the same time. The combination of construction activities from these multiple projects could result in significant cumulative impacts related to travel lane and road closures adjacent to the worksites, and construction traffic on local and regional roadways.

Construction Projects in the Lower Crystal Springs Dam Vicinity

Skyline Boulevard would be temporarily closed during construction activities at the LCSD site, requiring vehicles and bicycles to reroute to other roadways throughout the 14-month construction period. However, as described in Chapter 3, Section 3.8, Coordination with Other Local Projects, and in Section 5.1.4, Cumulative Projects, the LCSDI project would be designed and constructed in coordination with San Mateo County's Crystal Springs Dam Bridge Replacement project. The current construction schedule calls for a 6-month period to demolish the bridge, a 14-month period for LCSDI project construction, and a 12-month period to reconstruct the bridge. Therefore, a segment of Skyline Boulevard would be closed for approximately 32 continuous months from mid-2010 to mid-2013 to accommodate both the proposed project and San Mateo County's Crystal Springs Dam Bridge Replacement project.

Drivers would be expected to choose alternate routes to access their destinations for the duration of the closure. I-280 parallels Skyline Boulevard in the project area, and during the road closure, it is likely that some drivers would remain on I-280 rather than exiting and traveling on Skyline Boulevard, or would use I-280 as a detour route to access points north and south. Other drivers would divert to Crystal Springs Road, Polhemus Road, and Bunker Hill Drive and would use Highway 92 to access Polhemus Road. As part of the Crystal Springs Dam Bridge Replacement project, San Mateo County would develop and implement a traffic and bicycle detour plan, which would specify the provision of signage on I-280 to warn motorists about the Skyline Boulevard closure and detours. It is expected that these signs would be maintained for the duration of construction activities for the Crystal Springs Dam Bridge Replacement project and the LCSDI project.

The San Francisco Municipal Transportation Agency conducted an assessment of five projects in the Crystal Springs Road/Skyline Boulevard vicinity to determine the potential for overlap in construction activities and to present traffic control recommendations (SFMTA, 2008). The five projects are identified in Figure 5.1-2 and include:[5]

- SFPUC's LCSDI project
- San Mateo County's Crystal Springs Dam Bridge Replacement project
- SFPUC's Crystal Springs/San Andreas (CSSA) Transmission Upgrade project
- SFPUC's Crystal Springs Pipeline No. 2 (CSPL2) Replacement project – Sites 1 and 2
- SFPUC's New Crystal Springs Bypass Tunnel (NCSBT) project

As indicated in Table 5.1-1 and Figure 5.1-2, construction of these projects would occur over a four-year period between 2010 and 2014. Construction activities at the dam are currently scheduled to occur immediately following demolition of the Skyline Boulevard Bridge and are expected overlap with the construction of the CSSA Transmission Upgrade project (between late 2010 and late 2013), the CSPL2 Replacement project (mid-2011 through late 2011, or mid-2012 through late 2012 at Site 1; and from mid-2011 through late 2011, and possibly from mid-2012 through late 2012 at Site 2), and the NCSBT project (December 2008 through late 2011).

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[5] Although the SFMTA study did not include the PG&E Jefferson-Martin Transmission Line project, this project has been constructed except for the towers adjacent to the LCSD; therefore, construction-related traffic impacts associated with this project will be similar to those of the LCSDI related to work at the top of the dam.

Overlapping and concurrent construction activities would result in increased traffic volumes along Skyline Boulevard, Crystal Springs Road, Polhemus Road, Highway 92, and I-280 due to the presence of construction vehicles and construction worker vehicles from multiple projects in the same vicinity. In addition, due to the Skyline Boulevard closure, motorists would need to detour to other, potentially less convenient routes, and the closure would increase traffic volumes on Bunker Hill Drive, a residential street. While the effects of the detours and the additional construction-related vehicles could be accommodated within the capacity of the roadways and intersections, the increased traffic volumes, detours, and road and lane restrictions associated with the overlapping projects would increase potential traffic hazards for vehicles, bicycles, and pedestrians on Crystal Springs Road and Skyline Boulevard for an extended duration (approximately 32 months). This combined and prolonged effect would constitute a *potentially significant* cumulative impact on traffic operations, and the LCSDI's contribution to this impact would be cumulatively considerable. As described above, implementation of a traffic control plan for the LCSDI, as specified in Mitigation Measure M-TR-1 (Traffic Control Plan), would reduce the project's traffic impacts on Crystal Springs Road to a less-than-significant level. However, in addition, implementation of Mitigation Measure M-C-TR (Coordinated Peninsula Regional Transportation Management Plan), which would require the SFPUC or its contractors to coordinate the traffic control plan for the LCSDI with the traffic control plans for other SFPUC projects in the Peninsula region, would reduce the project's contribution to the cumulative impacts related to overlapping construction traffic to less-than-cumulatively considerable and therefore the cumulative impact would be less than significant.

Construction Projects in the Sampling Station #5 Vicinity

The construction of improvements at Sampling Station #5 would last for about four months and is currently scheduled to occur between June 2011 and October 2011. Construction activities could overlap with a number of other SFPUC improvement and repair projects at or near the Sampling Station #5 site, including the Pulgas Discharge Channel Modifications project, the Pulgas Structure Rehabilitation and Roof Replacement project, and the Pulgas Modification of Existing Dechloramination Facility project. However, all of these projects involve construction at existing SFPUC facilities and would not include roadway or travel lane closures on Cañada Road. Overlapping construction activities would result in incremental traffic volume increases along Cañada Road and I-280 due to construction vehicles and construction worker vehicles. However, due to the limited scale and duration of the individual improvement projects, cumulative impacts on traffic operations in this area would be *less than significant*, and no mitigation is required.

Other Construction Projects in the Peninsula Watershed

Construction activities at the LCSD and Sampling Station #5 sites could potentially overlap with construction activities associated with the SFPUC Habitat Reserve Program, although the schedule and extent of construction traffic impacts associated with the SFPUC Habitat Reserve Program are not currently known.

LCSDI construction traffic would contribute incrementally to traffic from three other private and public (non-SFPUC) projects in the project area that could be under construction or in operation at the same time, although their construction schedules are not currently known. A portion of the vehicle trips destined to and from two proposed residential developments (the proposed Highland Estates Residential Development project and the Ascension Heights Residential Development project, which are located less than 1.5 miles from the LCSD) could use the same regional roadways and highways as construction traffic generated by the LCSDI project. The Crystal Springs Regional Trail Extension project would occur at the LCSD site, although the schedule, location, extent of construction activities, and extent of construction traffic impacts are not currently known.

Overall, construction activities associated with the LCSDI project in combination with construction of other identified projects would increase potential traffic hazards for vehicles, bicycles, and pedestrians on Crystal Springs Road and Skyline Boulevard for an extended duration and could result in *potentially significant* impacts on traffic operations. Implementation of a traffic control plan, as specified in Mitigation Measure M-TR-1 (Traffic Control Plan), would reduce the project's traffic impacts to a less-than-significant level. In addition, as specified in Mitigation Measure M-C-TR (Coordinated Peninsula Regional Transportation Management Plan), an SFPUC construction coordinator would coordinate the traffic control plan for the LCSDI with the traffic control plans for non-SFPUC projects as appropriate, which would reduce the project's contribution to cumulative impacts related to overlapping construction traffic to a less-than-significant level.

Operational Effects

Implementation of the public projects and construction of the 36 residential dwelling units are not expected to cause substantial long-term increases in traffic volumes that would result in significant traffic impacts. Traffic associated with operation of the LCSDI would not change substantially from existing operational traffic, and therefore would not be discernible from future background traffic. Because the project's long-term, operational increase in vehicle trips would be negligible, the LCSDI's contribution to cumulative traffic increases during operation would not be cumulatively considerable (*less than significant*). No mitigation is required.

5.6.3.8 Cumulative Mitigation Measures

Mitigation Measure M-C-TR: Coordinated Peninsula Regional Transportation Management Plan.

The SFPUC and its regional construction management contractor shall work with San Mateo County to prepare and implement a transportation management plan for Skyline Boulevard/ Crystal Springs Road and to address the transportation impact of the five overlapping construction projects within the vicinity of the LCSD in the Peninsula watershed region. The transportation management plan shall include, but is not limited to, the following requirements:

- Coordination of individual traffic control plans for SFPUC projects and non-SFPUC projects.
- Coordination between the contractor and San Mateo County to develop circulation and detour plans that include safety features (e.g., signage and flaggers). The circulation and detour plans shall address:
    - Full and partial roadways closures
    - Circulation and detour plans to include the use of signage and flagging to guide vehicles through and/or around the construction zone, as well as any temporary traffic control devices
    - Bicycle detour plans
    - Parking for recreational uses along Skyline Boulevard
    - Haul routes for construction trucks and staging areas for instances when multiple trucks arrive at the worksite
    - Public information outreach program to notify nearby residents and recreational users of the Skyline Boulevard/Crystal Springs Road area of construction activities
- Protocols for updating the transportation management plan to account for delays or changes in the schedules of individual projects.

5.6.4 References

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5.7 Noise and Vibration

This section evaluates the potential noise impacts associated with constructing and operating the Lower Crystal Springs Dam Improvements (LCSDI) project. It describes the existing noise environment, presents relevant noise regulations and standards, identifies sensitive noise receptors that could be affected by the proposed project, and evaluates the potential effects of project construction on these receptors. It also evaluates the potential impacts of vibration on nearby sensitive receptors that could occur during project construction.

5.7.1 Setting

5.7.1.1 Noise Descriptors

dB, dBA. Sound is a phenomenon occurring in a medium (such as air or water), and the manner in which sound travels through this medium is influenced by the physical properties of the medium (such as temperature, density, humidity, etc.). The amount of energy in the sound is proportional to the pressure generated in the medium. The sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound, and the decibel (dB) scale is used to quantify sound intensity. Because sound can vary in intensity by over 1 million times within the range of human hearing, a logarithmic scale is used to keep sound pressure numbers at a convenient and manageable range. Since the human ear is not equally sensitive to all sound frequencies within the entire spectrum, human response is factored into sound descriptions in a process called "A-weighting," expressed as "dBA." The dBA, or A-weighted decibel, refers to a scale of noise measurement that approximates the range of sensitivity of the human ear to sounds of different frequencies. On this scale, the normal range of human hearing extends from about 0 dBA to about 140 dBA. A 10-dBA increase in the level of a continuous noise represents a perceived doubling of loudness. The noise levels presented in this section are expressed in terms of dBA, unless otherwise indicated. **Table 5.7-1** shows some representative noise sources and their corresponding noise levels in dBA.

Planning for acceptable noise exposure must take into account the types of activities and corresponding noise sensitivity in a specified location for a generalized land use type. Some general guidelines (U.S. EPA, 1974) are as follows: sleep disturbance may occur at levels above 35 dBA; interference with human speech begins at around 60 dBA; and hearing damage may result from prolonged exposure to noise levels in excess of 85 to 90 dBA.

Leq, CNEL, Ldn, Lmax. Time variations in noise exposure are typically expressed in terms of a steady-state energy level (called Leq) that represents the acoustical energy of a given measurement. Leq (24) is the steady-state energy level measured over a 24-hour period. Because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, state law requires that, for planning purposes, an artificial dBA increment be added to "quiet time" noise levels to form a 24-hour noise descriptor called the Community Noise Equivalent Level (CNEL). CNEL adds a 5-dBA "penalty" during the evening hours (7 p.m. to

TABLE 5.7-1
TYPICAL SOUND LEVELS MEASURED IN THE ENVIRONMENT

Examples of Common, Easily Recognized Sounds	Decibels (dBA)	Subjective Evaluations
Near Jet Engine	140	Deafening
Threshold of Pain	130	
Threshold of Feeling – Hard Rock Band	120	
Accelerating Motorcycle (at a few feet away)	110	
Loud Horn (at 10 feet away)	100	Very Loud
Noisy Urban Street	90	
Noisy Factory	85[a]	
School Cafeteria with Untreated Surfaces	80	Loud
Stenographic Room	70[b]	
Near Freeway Auto Traffic	60[b]	Moderate
Average Office	50[b]	
Soft Radio Music in Apartment	40	Faint
Average Residence Without Stereo Playing	30	
Average Whisper	20	Very Faint
Rustle of Leaves in Wind	10	
Human Breathing	5	
Threshold of Audibility	0	

[a] Continuous exposure above 85 dBA is likely to degrade the hearing of most people.
[b] The range of speech is 50 to 70 dBA.

SOURCE: U.S. Department of Housing and Urban Development, 1985.

10 p.m.) and a 10-dBA penalty during the night hours (10 p.m. to 7 a.m.). Another 24-hour noise descriptor, called the day-night noise level (Ldn), is similar to CNEL. While both add a 10-dBA penalty to all nighttime noise events between 10 p.m. and 7 a.m., Ldn does not add the evening 5-dBA penalty. In practice, Ldn and CNEL usually differ by less than 1 dBA at any given location for transportation noise sources. Lmax is the maximum instantaneous noise level taken during the measurement period.

5.7.1.2 Vibration Descriptors

Vibrations caused by construction activities can be interpreted as energy transmitted in waves through the ground. These energy waves generally dissipate with distance from the vibration source (e.g., pile driving or sheetpile driving). Because energy is lost during the transfer of energy from one particle to another, vibration is less perceptible with distance from the source. As discussed above for noise, vibration attenuates as a function of the distance between the source and receptor. For sources of vibration emanating from a single location (i.e., point sources), vibration attenuates at a rate of approximately 50 percent for each doubling of distance from the source. This is the "inverse square law." This approach tends to underestimate attenuation and therefore provides a "worst-case" estimate of vibration at the receptor.

Vibration is an oscillatory motion that can be described in terms of displacement, velocity, or acceleration. Peak particle velocity (PPV) is defined as the maximum instantaneous positive or negative peak of the vibration signal. PPV is used in assessing the potential for damage to buildings and structures and is expressed in inches per second (in/sec).

The responses of human receptors and structures are influenced by a combination of factors, including soil/rock type, distance, duration, and the number of perceived events. Energy transmitted through the ground as vibration can reach levels that cause structural damage; however, humans are very sensitive, and the vibration amplitudes that can be perceived by humans are well below the vibration that could potentially cause architectural or structural damage. A freight train passing at 100 feet can cause vibrations of 0.1 in/sec PPV, while a strong earthquake can produce vibration in the range of 10 in/sec PPV.

5.7.1.3 Existing Noise Environment

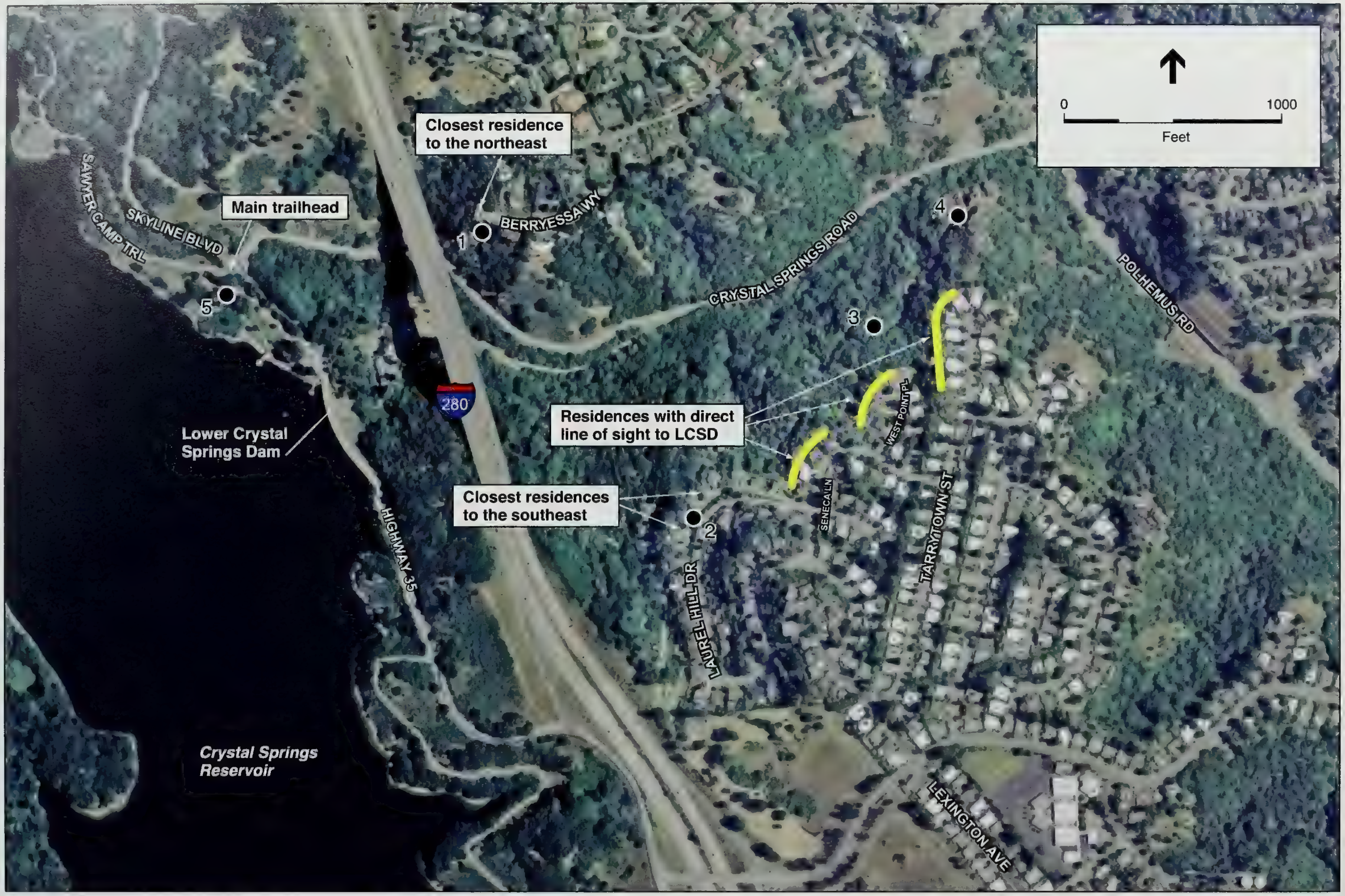
Lower Crystal Springs Dam Vicinity

Vehicular traffic on Interstate 280 (I-280) as well as on Crystal Springs Road, Skyline Boulevard, and Polhemus Road are the primary sources of noise in the Lower Crystal Springs Dam (LCSD) vicinity. To characterize the noise environment in the LCSD vicinity, five long-term (24-hour) noise measurements were taken in or adjacent to the residential neighborhoods that would be most affected by project construction. Measurement locations are shown on **Figure 5.7-1**, and a summary of measurement results is presented in **Table 5.7-2**.

Measurements were taken in residential neighborhoods located closest to the LCSD site, both north and south of Crystal Springs Road. The closest residential receptors are situated at the west end of Berryessa Way (Noise Measurement Location 1, Figure 5.7-1). The ambient noise environment at these receptors is dominated by freeway noise, and residences on this street are located at the same elevation as this freeway. Noise levels were measured at 68 dBA CNEL, with daytime and evening noise levels of 65 dBA Leq (7 a.m. to 10 p.m.) and nighttime noise levels of 59 dBA Leq (10 p.m. to 7 a.m.) at approximately 340 feet from the I-280 freeway centerline.

To the south of Crystal Springs Road, the closest residential receptors are located on the west/north side of Laurel Hill Drive (Noise Measurement Location 2, Figure 5.7-1). Taken in the center median of Laurel Hill Drive, the measurement indicates that ambient noise levels in this neighborhood are 62 dBA CNEL, with daytime and evening noise levels of 61 dBA Leq (7 a.m. to 10 p.m.) and nighttime noise levels of 53 dBA Leq (10 p.m. to 7 a.m.) at approximately 825 feet from the I-280 freeway centerline.

Measurements were also taken at two additional locations to the east, near residences that are farther from the site but have a direct line-of-sight to the LCSD (Noise Measurement Locations 3 and 4, Figure 5.7-1). These noise measurements, which were taken on the hillside below the



SOURCE: ENTRIX, Inc., 2008; ESA + Orion, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.7-1
Noise Measurement Locations

TABLE 5.7-2
SUMMARY OF NOISE MEASUREMENT RESULTS

	Hourly Noise Level (Leq) Measurements (dBA)				
Time	**Location 1 (Near 50 Berryessa Road)**	**Location 2 (Near 1276 Laurel Hill Drive)**	**Location 3 (Near North End of West Point Place)**	**Location 4 (Near North End of Tarrytown Street)**	**Location 5 (Near Sawyer Camp Trailhead)**
12 to 1 a.m.	58	51	41	40	44
1 to 2 a.m.	54	48	37	37	43
2 to 3 a.m.	51	45	35	36	43
3 to 4 a.m.	51	45	36	36	44
4 to 5 a.m.	55	50	41	40	43
5 to 6 a.m.	59	54	48	42	45
6 to 7 a.m.	64	57	50	47	49
7 to 8 a.m.	67	61	54	51	51
8 to 9 a.m.	68	63	52	53	53
9 to 10 a.m.	66	60	51	48	52
10 to 11 a.m.	65	59	52	49	51
11 a.m. to 12 p.m.	64	56	50	48	50
12 to 1 p.m.	65	56	50	48	53
1 to 2 p.m.	64	65	51	50	52
2 to 3 p.m.	62	58	52	50	51
3 to 4 p.m.	65	60	53	50	50
4 to 5 p.m.	67	61	54	51	51
5 to 6 p.m.	66	61	54	52	52
6 to 7 p.m.	65	61	53	50	51
7 to 8 p.m.	65	62	50	48	49
8 to 9 p.m.	63	59	47	46	47
9 to 10 p.m.	62	59	47	45	46
10 to 11 p.m.	62	56	44	41	45
11 p.m. to 12 a.m.	60	54	42	41	44
Day Leq (7 a.m. to 7 p.m.)	66	61	52	50	51
Evening Leq (7 p.m. to 10 p.m.)	64	60	48	46	47
Night Leq (10 p.m. to 7 a.m.)	59	53	44	42	45
CNEL or Ldn	**67**	**62**	**53**	**51**	**53**

Measurements at Locations 1 and 2 were taken from 1 p.m. on Tuesday, December 16, 2008 to 1 p.m. on Wednesday, December 17, 2008 using Extech Type II digital sound level meters at Locations 1 and 2. Measurements at Locations 3, 4, and 5 were taken from midnight to midnight on Tuesday, June 9, 2009 using two Quest SoundPro DL Type II digital sound level meters and a Metrosonics 208 Type II sound level meter.

Location 1 is approximately 340 feet from the I-280 centerline and 1,100 feet from the stilling basin at the base of the LCSD.
Location 2 is approximately 825 feet from the I-280 centerline and 1,700 feet from the stilling basin at the base of the LCSD.
Location 3 is approximately 1,850 feet from the I-280 centerline and 2,350 feet from the stilling basin at the base of the LCSD.
Location 4 is approximately 2,375 feet from the I-280 centerline and 2,900 feet from the stilling basin at the base of the LCSD.
Location 5 is approximately 930 feet from the I-280 centerline and 390 feet from the LCSD vista point parking lot.
Leq = steady-state energy level representing the acoustical energy of a given measurement; Ldn = day-night noise level that adds a 10-dBA penalty to all nighttime noise events between 10 p.m. and 7 a.m.

SOURCE: ESA+Orion, 2009.

homes located at the north ends of West Point Place and Tarrytown Street but facing the LCSD, indicated that noise levels are substantially lower (9 to 16 dBA lower) than in the neighborhoods located immediately east of the freeway. Ambient noise levels in the West Point Place vicinity are 53 dBA CNEL, with daytime noise levels of 52 dBA Leq (7 a.m. to 7 p.m.), evening noise levels of 48 dBA Leq (7 p.m. to 10 p.m.), and nighttime noise levels of 44 dBA Leq (10 p.m. to 7 a.m.) at approximately 1,850 feet from the I-280 freeway centerline. Farther east, ambient noise levels in the vicinity of the north end of Tarrytown Street are 51 dBA CNEL, with daytime noise levels of 50 dBA Leq (7 a.m. to 7 p.m.), evening noise levels of 46 dBA Leq (7 p.m. to 10 p.m.), and nighttime noise levels of 42 dBA Leq (10 p.m. to 7 a.m.) at approximately 2,375 feet from the I-280 freeway centerline.

Sampling Station #5 Vicinity

A short-term (15-minute) noise measurement was taken at the Pulgas Water Temple, which is located just east of the Sampling Station #5 site. The measured Leq over the duration of measurement was 47.8 dBA. Birds chirping in the trees formed the primary source of noise; traffic noise from Cañada Road was secondary due to the distance from the road as well as the lower elevation of the measurement location relative to Cañada Road.

5.7.1.4 Noise-Sensitive Land Uses

People in residences, schools, hospitals, nursing homes, and some outdoor recreation areas are generally more sensitive to noise than are people at commercial and industrial establishments. Consequently, the noise standards for these sensitive land uses are more stringent than those for less sensitive uses. Sensitive receptors in the vicinity of the proposed project include residences, schools, and hospitals. In general, residences and schools are among the land uses considered to be the most sensitive to noise.

Active parks and playgrounds are not as sensitive to noise as residences, schools, hospitals, or convalescent facilities, because the levels of background noise at parks with active recreational uses and school playgrounds are elevated. However, natural recreation areas require a degree of quiet for passive recreational uses. Open space or outdoor recreation areas that are used for passive recreational activities such as hiking and picnicking are considered noise-sensitive uses if the noise environment contributes to the recreational experience.

The locations of sensitive receptors in the LCSD vicinity are indicated in Figure 5.7-1. The closest sensitive receptors include recreationists using the Sawyer Camp Trail (just north of Noise Measurement Location 5 on Figure 5.7-1). The main trailhead is approximately 500 feet north of the vista point parking lot (Figure 5.7-1), but the trail connects with this parking lot. The closest residences are located at the west end of Berryessa Way in the town of Hillsborough north of Crystal Springs Road, approximately 1,000 feet northeast of the stilling basin at the base of the LCSD (corresponding to Measurement Location 1 on Figure 5.7-1) and on the west side of Laurel Hill Drive, approximately 1,450 feet southeast of the stilling basin (corresponding to Measurement Location 2 on Figure 5.7-1). Some residences in this same neighborhood are farther from the LCSD but have a direct line-of-sight to the dam; these residences are located on sections of Seneca Lane, West Point Place (just south of Location 3 on Figure 5.7-1), and Tarrytown Street (Location 4 on Figure 5.7-1). Other residences are located to the southeast, south of Crystal Springs Road, as close as 1,500 feet southeast of the stilling basin at the base of the LCSD along Laurel Hill Drive in unincorporated San Mateo County (Location 2 on Figure 5.7-1).

In addition to the suburban residential uses to the east of I-280, rural residential uses are located west of Crystal Springs Reservoir along Highway 92, between Skyline Boulevard and Quarry Road in Half Moon Bay. The nearest schools to the LCSD include Odyssey Middle School on Polhemus Road (approximately 4,000 feet to the northeast) and Highlands Elementary on Bunker Hill Drive (approximately 3,500 feet to the southeast). The nearest hospitals—Mills-Peninsula Medical Center and Brookside Skilled Nursing Facility—are located on El Camino Real, more than three miles from the LCSD.

Recreational uses at the Pulgas Water Temple would be the only noise-sensitive land use affected by the proposed construction at Sampling Station #5. The water temple is visited by recreational bicyclists and drivers and is also used as an outdoor venue for special occasions such as weddings. Besides recreational users, there are no noise-sensitive land uses, including residences, within a mile of the facility.

5.7.2 Regulatory Framework

5.7.2.1 Federal Regulations

There are no federal standards related to noise that apply to this project.

5.7.2.2 State Regulations

There are no state standards related to noise that apply to this project.

5.7.2.3 Local Regulations

At the local level, noise is addressed through the implementation of general plan policies, including noise and land use compatibility guidelines, and through enforcement of noise ordinances. General plan policies provide guidelines for determining whether a noise environment is appropriate for a proposed or planned land use. Noise ordinances regulate sources (such as mechanical equipment and amplified sounds) as well as prescribe hours of heavy equipment operation (such as for construction). CEQA requires that environmental analyses consider local noise ordinances and standards in determining the significance of noise impacts. However, due to intergovernmental immunity, the SFPUC is exempt from compliance with the zoning and building ordinances of other cities and counties for the construction or operation of its water system (refer to Chapter 4, Plans and Policies, for a detailed discussion of the SFPUC's intergovernmental immunity).

San Mateo County

San Mateo County's Noise Ordinance standards are provided below in **Table 5.7-3**. Section 4.88.360(e) of the ordinance specifically exempts construction noise sources from complying with the provisions of the ordinance noise limits as long as the construction activity occurs between 7 a.m. and 6 p.m., Monday through Friday, or between 9 a.m. and 5 p.m. on Saturdays, excluding Thanksgiving and Christmas. Therefore, the ordinance is intended to limit noise from construction activities that are performed in the evenings or at night (between 6 p.m. and 7 a.m. on weekdays and before 9 a.m. and after 5 p.m. on Saturday) to the nighttime noise limits listed in Table 5.7-3. The ordinance places specific limits on noise levels for various time intervals during a one-hour period.

TABLE 5.7-3
SAN MATEO COUNTY NOISE LIMITS[a]

Category	Cumulative Number of Minutes[b] (in any one-hour time period)	Daytime[c] 7 a.m. to 10 p.m. (dBA)	Nighttime[c] 10 p.m. to 7 a.m. (dBA)
1	30	55	50
2	15	60	55
3	5	65	60
4	1	70	65
5	0	75	70
	Equivalent Leq[d]	63	58

[a] These limits are only applicable to construction outside the normally allowed construction hours of 7 a.m. to 7 p.m. (weekdays) and 9 a.m. to 5 p.m. (Saturday), except for Thanksgiving and Christmas. In the event the measured ambient noise level exceeds the applicable noise level standard in any category above, the applicable standard shall be adjusted upwards in 5-dBA increments so as to encompass the ambient noise level. Each of the noise level standards specified above must be reduced by 5 dBA for simple tonal noise, consisting primarily of speech or music, or for recurring or intermittent impulsive noise.

[b] This refers to the number of minutes in any one hour that the specified noise level can be exceeded. For example, a noise exceeding 55 dBA would be allowed to occur for 30 minutes during the daytime, but only 15 minutes at night.

[c] Since noise limits apply to activities occurring outside of specified construction hours, the daytime limits would apply to construction activities occurring from 6 p.m. to 10 p.m. (weekdays) as well as from 7 a.m. to 9 a.m., and 5 p.m. to 10 p.m. (Saturdays). Nighttime limits would apply to construction activities occurring from 10 p.m. to 7 a.m. everyday. Both daytime and nighttime limits would apply to activities occurring anytime on Sunday.

[d] For purposes of evaluating noise, this analysis uses the Leq instead of the individual cumulative noise categories to calculate the equivalent per-minute noise level over an hour. Based on the statistical metrics used above, it is possible to determine an equivalent noise level (Leq) for a time-varying noise with known noise levels and known time durations. A time-varying noise that is within the upper bound of the San Mateo County Noise Ordinance (e.g., 50, 55, 60, 65, and 70 dBA) with cumulative time durations (e.g., 30, 15, 10, and 5 minutes and 1 minute, respectively) would result in an equivalent noise level (Leq) of 58 dBA. Since it is difficult to predict the actual statistical distribution for the construction noise, the one-hour Leq is an appropriate way of determining consistency with the San Mateo County Noise Ordinance.

SOURCE: San Mateo County Noise Ordinance, with equivalent Leq provided by Wilson Ihrig & Associates 2009.

To develop a practicable and feasible performance standard that the SFPUC could enforce during construction, the various noise limits were aggregated for specific time intervals into one equivalent one-hour noise level (a noise level of 70 dBA was assumed to occur for less than one minute), and the equivalent one-hour noise level was calculated to be 63 dBA Leq for daytime noise and 58 dBA Leq for nighttime noise, based on the requirements of the ordinance. The 63 dBA Leq and 58 dBA Leq (one hour) therefore represent the maximum noise levels that would be consistent with the San Mateo County Noise Ordinance, as measured at the exterior of the nearest residential receptor during the daytime and nighttime periods, respectively. Note that these limits only pertain to times beyond the time periods allowable for construction.

The San Mateo County Noise Element does not provide specific criteria for the evaluation of noise impacts; however, the County has prepared guidelines for evaluating noise impacts in accordance with CEQA. These guidelines indicate that noise assessments should evaluate whether a project will "generate unusually high noise levels."

Town of Hillsborough

Because the LCSDI project is located outside the town limits, the noise limits and construction time limits of the Town of Hillsborough's Noise Ordinance would not apply to this project. However, the closest receptors are located within the town, so the ordinance limits are included for CEQA purposes. The noise ordinance limits general noise levels to 70 dBA at a distance of 25 feet from the source between the hours of 7 a.m. and 5 p.m., Monday through Friday. On Saturdays, no noise is allowed before 10 a.m. and after 5 p.m., and no construction activity is allowed on Sundays. Construction noise for projects conducted in the town is allowed from 8 a.m. to 5 p.m. Monday through Friday, excluding holidays (Section 8.32.040). During the week, construction equipment noise is limited to 100 dBA or less at a distance of 25 feet from the source, and the noise levels from all sources must not exceed 100 dBA at 25 feet outside the plane of the property line. On Saturdays, construction is allowed between 10 a.m. and 5 p.m., and the combined noise level from all construction activity is limited to 70 dBA at a distance of 25 feet outside the property line plane.

The Hillsborough Noise Element (Town of Hillsborough, 2005) does not provide specific criteria for construction noise impacts, but Policy N-1.3 states the intent to enforce local and state noise regulations to minimize noise impacts associated with construction as well as public and private activities. The Noise Element indicates a slightly different set of allowable hours for construction from those provided in the ordinance: Monday through Friday 8 a.m. to 5 p.m., and Saturday 10 a.m. to 5 p.m.

The Noise Element also indicates that for single-family residential areas, a noise environment of up to 60 dBA (Ldn or CNEL) is normally acceptable, and 55 to 70 dBA (Ldn or CNEL) is conditionally acceptable.

5.7.3 Impacts and Mitigation Measures

5.7.3.1 Significance Criteria

The City and County of San Francisco has not formally adopted significance standards for impacts related to noise and vibration, but generally considers that implementation of a project would have a significant noise and/or vibration impact if it were to:

- Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;

- Result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;
- Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- For a project located within an airport land use plan area, or, where such a plan has not been adopted, in an area within two miles of a public airport or public use airport, would the project expose people residing or working in the area to excessive noise levels;
- For a project located in the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels; or
- Be substantially affected by existing noise levels.

In addition to the above criteria, this EIR considers that the project would have a significant vibration impact if the project were to:

- Result in the potential for building damage, including cosmetic damage; or
- Result in the exposure of people to vibration that would have the potential for sleep disturbance or interruption of normal living activity

Due to the nature of the proposed project, there would be no impacts related to the following criteria for the reasons stated below:

> *Noise Levels Near Airports or Airstrips*. The two airport-related significance criteria are not applicable to the LCSDI project. There are no private airstrips in the project vicinity. Therefore, the LCSDI project would not result in the long-term exposure of workers to excessive airport-related noise levels, and no further discussion of these criteria is presented.
>
> *Existing Noise Levels*. The proposed LDSDI project is a water utility project and would not be affected by existing noise levels. Since the project is not a noise-sensitive land use, the last criterion would not apply to this project, and no further discussion is presented.

5.7.3.2 Approach to Analysis

The noise impact assessment evaluates short-term (temporary) impacts associated with the construction of project facilities as well as long-term (permanent) impacts resulting from project operations. For construction noise, the potential for impacts was assessed by considering several factors, including the proximity of project-related noise sources to sensitive receptors, typical noise levels associated with construction equipment, the potential for construction noise levels to interfere with daytime and nighttime activities, the duration that sensitive receptors would be affected, and whether proposed activities would occur outside the construction time limits specified in local ordinances. For operational noise, the potential for impacts was assessed by evaluating the noise generation potential of project facilities; if the project would introduce a new source of noise, the evaluation considered the proximity to sensitive receptors and the potential for operational noise to remain within noise ordinance limits at the nearest receptors.

To address the CEQA significance criterion regarding "substantial temporary or periodic noise increases in ambient noise levels" for the analysis of construction noise, a "substantial" noise increase is defined as an increase in noise to a level that causes interference with activities during the day and/or night. One indicator that construction noise could interfere with daytime activities would be speech interference, and an indicator that construction noise could interfere with nighttime activities would be sleep interference. Temporary exposure to noise from construction activities during the daytime above these thresholds (two weeks or less) is considered to result in a less-than-significant impact. This analysis uses the following criteria to define potential "substantial" noise impacts:

- _Speech Interference_. Speech interference is an indicator of impact on typical daytime and evening activities. A speech interference threshold, in the context of impact duration and time of day, is used to identify substantial increases in noise from temporary construction activities. Noise peaks generated by construction equipment could result in speech interference in adjacent buildings if the noise level in the interior of the building exceeds 45 to 60 dBA. A typical building can reduce noise levels by 25 dBA with the windows closed (U.S. EPA, 1974). This noise reduction could be maintained only on a temporary basis in some cases, since it assumes windows must remain closed at all times. Assuming a 25-dBA reduction with the windows closed, an exterior noise level of 70 dBA Leq at receptors would maintain an acceptable interior noise environment of 45 dBA. With windows open, exterior noise levels of 70 dBA Leq would be reduced to 55 dBA, which would still provide acceptable interior noise levels but could cause occasional speech interference effects. It should be noted that such noise levels would be sporadic rather than continuous in nature, because different types of construction equipment would be used throughout the construction process. For this analysis, noise levels above the 70-dBA speech interference threshold that occur on consecutive workdays for longer than two weeks[1] is considered a significant noise impact.

  However, for outdoor passive recreational uses, such as hiking along the Sawyer Camp Trail, noise levels above 60 dBA Leq are considered to be significant, since speech interference can occur at lower noise levels due to the lack of building attenuation benefits.

- _Sleep Interference_. Based on available sleep criteria data, an interior nighttime level of 35 dBA is considered acceptable (U.S. EPA, 1974). Assuming a 25-dBA reduction with the windows closed, an exterior noise level of 60 dBA at receptors would maintain an acceptable interior noise environment of 35 dBA. Since a 15-dBA reduction would occur with windows open, an exterior noise level of 50 dBA Leq would be required to maintain an acceptable interior noise environment of 35 dBA. Construction work might be conducted during the nighttime hours at the base of the dam, which could adversely affect nearby residential receptors to the east.

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[1] Since construction would occur during warm weather (summer and fall), a maximum duration of two weeks at a time is applied for closed windows (needed to maintain an interior noise environment that allows for normal conversation), since residents without air conditioning would need to open windows for ventilation during warm weather.

This noise impact assessment estimates noise levels associated with project construction and compares construction noise levels against the speech interference threshold where daytime construction would occur and against the sleep interference threshold where nighttime construction would occur.

To address the CEQA significance criterion regarding "noise levels in excess of standards established in the local general plan or noise ordinance," this EIR considers the standards in the San Mateo County and Town of Hillsborough Noise Ordinances. CEQA requires that the determination of significance of noise impacts take account of local noise ordinances and standards. For this analysis, a noise impact could be considered significant if project-related noise levels exceed the standards established in the San Mateo County and Town of Hillsborough Noise Ordinances.

Project excavation and facility construction would cause vibration that could disturb local residents or cause cosmetic damage to buildings and structures. The impact assessment for vibration assesses whether construction would result in excessive groundborne vibration. The vibration impact analysis presented below uses standard analytical methodologies, such as estimating vibration levels at sensitive receptors for a given vibration source and setback distance, comparing the estimated vibration level to recommended limits or significance thresholds, determining potentially significant impacts on nearby sensitive receptors, and providing mitigation where applicable.

5.7.3.3 Impact Summary

Table 5.7-4 summarizes the results of the noise and vibration impact analysis.

TABLE 5.7-4
SUMMARY OF IMPACTS – NOISE AND VIBRATION

	Significance Determination	
Impact	**LCSD site**	**Sampling Station #5 site**
Impact NO-1: Disturbance from temporary, construction-related, on-site noise increases.	SU	PSM
Impact NO-2: Consistency with noise ordinance limits.	SM	LS
Impact NO-3: Temporary noise disturbance along construction haul routes.	SU	LS
Impact NO-4: Noise disturbance due to construction-related blasting.	SM	N/A
Impact NO-5: Temporary disturbance due to construction-related vibration.	LS	LS
Impact NO-6: Disturbance due to noise and vibration increases associated with the operation and maintenance of project facilities.	LS	LS
Impact C-NO: Cumulative increases in construction noise in the LCSD vicinity and along construction haul and delivery routes.	PSU	LS

B = Beneficial impact
N/A = Not Applicable or no impact
LS = Less than Significant impact, no mitigation required
SM = Significant impact, can be Mitigated to less than significant
PSM = Potentially Significant impact, can be Mitigated to less than significant
SU = Significant Unavoidable impact
PSU = Potentially Significant Unavoidable impact

5.7.3.4 Construction Impacts

Impact NO-1: Disturbance from temporary, construction-related, on-site noise increases.

Project-related construction activities would result in temporary noise increases at sensitive receptors located adjacent to or near the project sites. Construction noise levels would vary at any given receptor depending on the type of construction activity, construction phase, equipment type and duration of use, distance between the noise source and receptor, and the presence or absence of barriers between the noise source and receptor. In addition, over the nine months during which all major construction activities would occur, there would be times when the weather would allow windows to remain closed during the daytime and/or nighttime hours, which would help to maintain a quieter interior noise environment than the estimates in this analysis.

For construction noise, a "substantial" noise increase is defined as short-term interference with activities during the day and night. One indicator that construction noise could interfere with daytime activities would be speech interference, and an indicator that construction noise could interfere with nighttime activities would be sleep interference. Since there are different thresholds for determining the significance of noise impacts during the day and night, noise impacts associated with project construction were separated into two categories: (1) daytime and evening (7 a.m. to 10 p.m.) construction, when the 70-dBA speech interference threshold was applied; and (2) nighttime (10 p.m. to 7 a.m.) construction, when the 50-dBA sleep interference threshold was applied.

Project construction would occur during the day shift, approximately 6 a.m. to 2 p.m. (weekdays and possibly on weekends) over the entire nine-month construction duration. However, a swing shift (approximately 2 p.m. to 10 p.m.) and night shift (approximately 10 p.m. to 6 a.m.) would be utilized as necessary for at least part of the time (up to six months) to meet the construction schedule.

The types of construction equipment likely to be used for this project are listed in Chapter 3, Project Description, Section 3.6.7, Workforce and Equipment. These equipment types typically generate maximum noise levels ranging from about 76 to 113 dBA at a distance of 50 feet from the source. The rate of attenuation (i.e., reduction) is about 6 dBA for every doubling of distance from a point source. **Table 5.7-5** indicates noise levels at 50, 400, and 1,000 feet from the noise source for typical construction equipment. For this analysis, the noise levels were grouped according to their proposed operation at the LCSDI site. Earthmoving and truck operations in onsite spoils areas at the east end of the site would be located closest to sensitive receptors—as close as approximately 460 feet from homes at the west end of Berryessa Way. Earthmoving equipment (excavators, concrete breakers, backhoes, bulldozers, graders), drill rigs, and concrete removal/placement equipment would operate at the toe of the dam as part of stilling basin construction, which would be approximately 1,000 feet from the closest home at the end of Berryessa Way. Other types of equipment (grout mixers, grout pumps, rock/concrete crusher, drill rigs, crane, compressors, generators, etc.) would be operated at the top of the dam to install grout anchors.

TABLE 5.7-5
NOISE LEVELS AND ABATEMENT POTENTIAL OF CONSTRUCTION EQUIPMENT NOISE AT 50, 600, AND 1,200 FEET (dBA)

	Noise Level at 50 Feet		Noise Level at 400 Feet		Noise Level at 1,000 Feet	
Equipment	**Without Controls**	**With Controls[a]**	**Without Controls**	**With Control[a]**	**Without Controls**	**With Controls[a]**
Earthmoving						
Backhoes, Loaders	80	75	62	57	54	49
Dozers	80	75	62	57	54	49
Tractors	80	75	62	57	54	49
Graders, Excavators	85	75	67	57	59	49
Trucks	91	75	73	57	65	49
Materials Handling						
Concrete Mixers	85	75	67	57	59	49
Concrete Pumps	82	75	64	57	56	49
Cranes	83	75	65	57	57	49
Derricks/Drill Rigs	88	75	70	57	62	49
Stationary						
Pumps	76	75	58	57	50	49
Generators	78	75	60	57	52	49
Compressors	81	75	63	57	55	49
Impact						
Controlled Blasting		110/138[b]		92/120		84/112
Concrete Breaker		113		95		87
Rock Drills	98	80	80	62	72	54
Jack Hammers, Concrete Crusher	88	75	70	57	57	49
Pneumatic Tools	86	80	68	62	60	54
Other						
Saws	78	75	60	57	52	49
Vibrators	76	75	58	57	50	49

[a] Estimated levels can be obtained by selecting quieter procedures or machines and implementing noise control features that do not require major redesign or high cost (e.g., improved mufflers, equipment redesign, and use of silencers, shields, shrouds, ducts, and engine enclosures).

[b] Warning horns would sound (110 dBA at 50 feet) prior to blasting (138 dBA at 50 feet).

SOURCES: U.S. Environmental Protection Agency, 1971; U.S. Department of Transportation, Federal Transit Administration, 2006.

The corresponding noise levels at the closest receptors were then estimated based on the approximate minimum distance to the stilling basin and onsite spoils area at the toe of the dam as well as the top of the dam. **Table 5.7-6** presents estimated daytime noise levels at the closest sensitive receptors to the LCSD site, including recreationists at the Sawyer Camp Trail, residences at the west end of Berryessa Way, and residences on Laurel Hill Drive. Construction-related noise levels were also estimated at more distant residential receptors on West Point Place and Tarrytown Street where ambient noise levels are lower (due to the greater distance from the freeway), but where some receptors still have a direct line-of-sight to the dam and would be subject to construction noise.

TABLE 5.7-6
ESTIMATED DAYTIME CONSTRUCTION NOISE LEVELS AT THE CLOSEST SENSITIVE RECEPTORS

Receptor Location and Project Facility	Maximum Noise Source	Reference Hourly Leq in dBA at 50 feet[a]	Minimum Distance Between Closest Receptor and Source[b]	Distance Adjustment	Adjusted Leq	Exterior Speech Interference Criterion[c]	With Mitigation Measure M-NO-1	Mitigated Leq	Daytime Ambient Noise Level	Evening Ambient Noise Level
Noise Levels at Closest Residential Receptors to the Northeast (Minimum Distance from Noise Sources to Residences on Berryessa Way)										
Stilling Basin at Toe of Dam	2 Loaders/Backhoes/Dozers	83	1,000	-26	57	70	-5	52	66	64
	3 Graders/Excavators	90	1,000	-26	64	70	-10	54	66	64
	6 Dump Trucks	99	1,000	-26	73	70	-16	57	66	64
	1 Water Truck	88	1,000	-26	62	70	-13	49	66	64
	2 Concrete Mixers	88	1,000	-26	62	70	-10	52	66	64
	2 Concrete Pumps	85	1,000	-26	59	70	-7	52	66	64
	2 Drill Rigs	91	1,000	-26	65	70	-13	52	66	64
	2 Compressors	92	1,000	-26	66	70	-6	60	66	64
	2 Generators	81	1,000	-26	55	70	-3	52	66	64
On-site Spoils Area	1 Loader/Backhoe/Dozer	80	460	-19	61	70	-5	56	66	64
	1 Grader/Excavator	85	460	-19	66	70	-10	56	66	64
	2 Dump Trucks	94	460	-19	75	70	-16	59	66	64
Parapet Wall at Top of Dam	2 Grout Mixers	88	1,050	-26	62	70	-10	52	66	47
	2 Grout Pumps	85	1,050	-26	59	70	-7	52	66	47
	1 Concrete Crusher	85	1,050	-26	59	70	-7	52	66	47
	1 Crane	83	1,050	-26	57	70	-8	49	66	47
	6 Drill Rigs	96	1,050	-26	70	70	-13	57	66	47
	2 Compressors	92	1,050	-26	66	70	-6	60	66	47
	2 Generators	81	1,050	-26	55	70	-3	52	66	47
	2 Motorized Boats per Barge	82	1,050	-26	56	70	0	56	66	47
	COMBINED LEVEL	*104*			***79***	*70*		*68*	*66*	*47*
Noise Levels at Closest Residential Receptors to the Southeast (Minimum Distance from Noise Sources to Residences on Laurel Hill Drive)										
Stilling Basin at Toe of Dam	2 Loaders/Backhoes/Dozers	83	1,450	-30	53	70	-5	48	61	60
	3 Graders/Excavators	90	1,450	-30	60	70	-10	50	61	60
	6 Dump Trucks	99	1,450	-30	69	70	-16	53	61	60
	1 Water Truck	88	1,450	-30	58	70	-13	45	66	64
	2 Concrete Mixers	88	1,450	-30	58	70	-10	48	61	60
	2 Concrete Pumps	85	1,450	-30	55	70	-7	48	61	60
	2 Drill Rigs	91	1,450	-30	61	70	-13	48	61	60
	2 Compressors	92	1,450	-30	62	70	-6	56	61	60
	2 Generators	81	1,450	-30	51	70	-3	48	61	60
On-site Spoils Area	1 Loader/Backhoe/Dozer	80	800	-24	56	70	-5	51	66	64
	1 Grader/Excavator	85	800	-24	61	70	-10	51	66	64
	2 Dump Trucks	94	800	-24	70	70	-16	54	66	64
Parapet Wall at Top of Dam	2 Grout Mixers	88	1,550	-30	58	70	-10	48	61	47
	2 Grout Pumps	85	1,550	-30	55	70	-7	48	61	47
	1 Concrete Crusher	85	1,550	-30	55	70	-7	48	61	47
	1 Crane	83	1,550	-30	53	70	-8	45	61	47
	6 Drill Rigs	96	1,550	-30	66	70	-13	53	61	47
	2 Compressors	92	1,550	-30	62	70	-6	56	61	47
	2 Generators	81	1,550	-30	51	70	-3	48	61	47
	2 Motorized Boats per Barge	82	1,550	-30	52	70	0	52	61	47
	COMBINED LEVEL	*103*			***75***	*70*		*63*	*61*	*47*

TABLE 5.7-6 (Continued)
ESTIMATED DAYTIME CONSTRUCTION NOISE LEVELS AT THE CLOSEST SENSITIVE RECEPTORS

Receptor Location and Project Facility	Maximum Noise Source	Reference Hourly Leq in dBA at 50 feet[a]	Minimum Distance Between Closest Receptor and Source[b]	Distance Adjustment	Adjusted Leq	Exterior Speech Interference Criterion[c]	With Mitigation Measure M-NO-1	Mitigated Leq	Daytime Ambient Noise Level	Evening Ambient Noise Level
Noise Levels at Closest Residential Receptors to the Southeast with Direct Line-of-Sight to Dam but Farthest from Freeway (Minimum Distance from Noise Sources to Residences on Tarrytown St.)										
Stilling Basin at Toe of Dam	2 Loaders/Backhoes/Dozers	83	2,700	-38	45	70	-5	40	50	46
	3 Graders/Excavators	90	2,700	-38	52	70	-10	42	50	46
	6 Dump Trucks	99	2,700	-38	61	70	-16	45	50	46
	1 Water Truck	88	2,700	-38	50	70	-13	37	66	64
	2 Concrete Mixers	88	2,700	-38	50	70	-10	40	50	46
	2 Concrete Pumps	85	2,700	-38	47	70	-7	40	50	46
	2 Drill Rigs	91	2,700	-38	53	70	-13	40	50	46
	2 Compressors	92	2,700	-38	54	70	-6	48	50	46
	2 Generators	81	2,700	-38	43	70	-3	40	50	46
On-site Spoils Area	1 Loader/Backhoe/Dozer	80	800	-24	56	70	-5	51	66	64
	1 Grader/Excavator	85	800	-24	61	70	-10	51	66	64
	2 Dump Trucks	94	800	-24	70	70	-16	54	66	64
Parapet Wall at Top of Dam	2 Grout Mixers	88	2,900	-38	50	70	-10	40	50	47
	2 Grout Pumps	85	2,900	-38	47	70	-7	40	50	47
	1 Concrete Crusher	85	2,900	-38	47	70	-7	40	50	47
	1 Crane	83	2,900	-38	45	70	-8	37	50	47
	6 Drill Rigs	96	2,900	-38	58	70	-13	45	50	47
	2 Compressors	92	2,900	-38	54	70	-6	48	50	47
	2 Generators	81	2,900	-38	43	70	-3	40	50	47
	2 Motorized Boats per Barge	82	2,900	-38	44	70	0	44	50	47
	COMBINED LEVEL	*103*			***72***	*70*		*59*	*50*	*47*
Noise Levels at Closest Recreational Receptors (Minimum Distance from Noise Sources to the Closest Section of Sawyer Camp Trail with Direct Line-of-Sight)[d]										
Parapet Wall at Top of Dam	2 Grout Mixers	88	1,100	-27	61	60	-10	51	51	47
	2 Grout Pumps	85	1,100	-27	58	60	-7	51	51	47
	1 Rock/Concrete Crusher	90	1,100	-27	63	60	-7	56	51	47
	1 Crane	83	1,100	-27	56	60	-8	48	51	47
	6 Drill Rigs	96	1,100	-27	69	60	-13	56	51	47
	2 Compressors	92	1,100	-27	65	60	-6	59	51	47
	2 Generators	81	1,100	-27	54	60	-3	51	51	47
	2 Motorized Boats per Barge	82	1,100	-27	55	70	0	55	51	47
	COMBINED LEVEL	*99*			***72***	*60*		*64*	*51*	*47*

NOTES: Noise levels in BOLD exceed the 70-dBA speech interference criterion.

[a] Reference noise levels represent noise levels for similar equipment types (without controls) listed in Table 5.7-5 at 50 feet. These estimates assume that specified equipment would be operated 100 percent of the time at full throttle at the closest possible distance to the receptor. While unlikely to occur, this worst-case assumption is intended to offset the various distances of other pieces of equipment operating in the vicinity with variable throttle speeds and durations during any given hour.

[b] Distances represent the minimum distance between the receptor and the closest construction activity. Distances between a given receptor and multiple equipment noise sources would vary, so combined noise levels are considered very conservative since they assume all equipment would operate at the same closest location.

[c] The speech interference criterion for residential receptors is 70 dBA, while a lower criterion (60 dBA) is applied to recreationists using the Sawyer Camp Trail.

[d] The trailhead of the Sawyer Camp Trail is approximately 500 feet from the staging areas located north of the dam. Due to intervening topography, the closest location along the trail with a direct line-of-sight to the dam is approximately 1,100 feet from the dam.

SOURCE: Orion Environmental Associates, 2009.

Daytime Construction Activities

Most project construction activities (including all excavation work and most concrete placement activities, such as pouring) would occur primarily during the day and swing shifts (approximately 6 a.m. to 10 p.m.).

Lower Crystal Springs Dam Vicinity

As indicated in Table 5.7-6, project-related construction activities at the toe and top of the dam could periodically exceed the 70-dBA speech interference threshold at the closest residential receptors to the east (e.g., those with a direct line-of-sight on Berryessa Way, Laurel Hill Drive, Seneca Lane, West Point Place, and Tarrytown Street), a *potentially significant* impact. Construction-related noise would also exceed daytime and evening ambient noise levels at these receptors, indicating that construction noise could periodically be audible despite the freeway-dominated noise environment at these receptors. With implementation of Mitigation Measure M-NO-1 (Administrative and Source Controls), construction-related noise could be reduced to less-than-significant levels at all residential receptors to the east (see Table 5.7-6). Implementation of Mitigation Measure M-NO-1 would reduce the combined noise levels (i.e., those combined noise levels at the closest receptors listed in Table 5.7-6, which conservatively assumes all equipment would operate simultaneously at full throttle) to below the 70-dBA speech interference threshold. More likely, all identified equipment would not operate simultaneously; identified equipment would be distributed over the construction areas at the top and toe of the dam; and equipment would operate at variable throttle speeds. However, if the worst-case condition were to occur, mitigated combined levels could periodically exceed daytime and evening ambient noise levels at residential receptors located east of I-280 (those with a direct line-of-site on Berryessa Way, Laurel Hill Drive, Seneca Lane, West Point Place, and Tarrytown Street), indicating that construction noise could periodically be audible at these residences, even with implementation of Mitigation Measure M-NO-1.

Noise levels at the closest locations on the Sawyer Camp Trail with a direct line-of-sight to the top of the dam would be subject to construction noise that exceeds the 60-dBA speech interference threshold for outdoor uses, and project-related noise would exceed ambient noise levels along the southern 750 feet of this trail; this impact would be *significant.* Intervening topography would block views of the dam from the southernmost 400 feet of this trail section, which would help reduce construction noise. However, there would be a 350-foot trail section that would have a direct line-of-sight to the dam and no topographic barrier. North of the 750-foot section, the trail turns so that construction noise would be completely blocked by intervening topography; therefore, from this point in the trail and northward, the impact would be less than significant. With implementation of Mitigation Measure M-NO-1 (Administrative and Source Controls), construction-related noise levels associated with each type of equipment would not exceed the 60-dBA speech interference threshold for recreationists at the south end of the Sawyer Camp Trail, and therefore, the impact would be reduced to a less-than-significant level. Although the worst-case (combined) noise level listed in Table 5.7-6 is estimated at 63 dBA even with implementation of Mitigation Measure M-NO-1, it is unlikely that this noise level would occur since it represents the worst-case scenario in which all proposed equipment is operating simultaneously at full throttle at the north end of the dam. More likely, identified equipment would be distributed over the top of the dam[2] and would operate at variable throttle speeds.

In addition to noise associated with equipment operation, nearby residential receptors would also be subject to noise from backup alarms used in construction vehicles. Backup alarms for haul trucks must be audible above the surrounding ambient noise level at a distance of 200 feet.[3] The characteristics of the alarm tone mean that backup alarms are often designed to be 10 to 15 dBA higher than the worst-case construction/industrial operating environment. Therefore, backup alarms are typically designed to emit a sound as loud as 85 to 115 dBA, since the construction noise environment at 50 feet behind any piece of moving machinery could be as high as 70 to 90 dBA. This would correspond to a sound level of 59 to 89 dBA (Lmax) at 1,000 feet, which could be audible at times at the closest residential receptors to the east. However, given the predominant ambient freeway noise during the daytime and evening hours and the nine-month construction duration, impacts related to potential annoyance effects at the closest receptors would be *less than significant*. Even though impacts related to backup alarms would be less than significant, implementation of Mitigation Measure M-NO-1 (Administrative and Source Controls), which requires administrative and source controls for backup alarms to the extent feasible, would help to further reduce the potential for annoyance effects.

Sampling Station #5 Vicinity

The proposed raising of Sampling Station #5 near the Pulgas Water Temple would require the operation of excavators, loaders, cranes, concrete and dump trucks, compressors, and generators as close as approximately 700 feet from the water temple. Vehicle and equipment operations in the closest staging area would be as close as approximately 100 feet from the water temple. Based on noise levels for these types of equipment (see Table 5.7-5), construction activities at the sampling station site could result in construction-related noise levels of 57 to 68 dBA Leq at the water temple, or approximately 5 dBA lower than those listed in the middle column ("Noise Level at 400 Feet") of Table 5.7-5 for the equipment types to be used. Some of the higher noise levels generated by excavators, concrete and dump trucks, and compressors could periodically exceed the 60-dBA outdoor speech interference threshold. Since construction equipment would operate anywhere from 100 to 800 feet west of the water temple, visitors to the water temple could experience speech interference, particularly during special events like weddings. Because speech interference could occur anytime during the construction period, the impact would be *potentially significant*; however, implementation of Mitigation Measure M-LU-1b (Event Scheduling at the Pulgas Water Temple) in Section 5.2, Land Use, which restricts special events at the Pulgas Water Temple during the four months of construction at Sampling Station #5, would avoid any potential disturbance of such events, reducing this impact to a less-than-significant level.

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[2] Equipment locations would vary between 1,100 and 1,700 feet from the closest point on the section of the trail with a direct line-of-sight. This range of distances would result in noise levels varying by up to 4 dBA.

[3] The California Department of Occupational Safety and Health requires backup warning alarms that activate immediately upon reverse movement on all vehicles with a hauling capacity of 2.5 cubic yards or more that are used to haul dirt (Title 8, California Code of Regulations, Section 1592).

The closest residential receptors to the sampling station site are located over one mile to the east (east of I-280) and would not be affected by project-related construction noise at this site. At this distance, construction-related maximum noise levels associated with construction of project facilities at the sampling station site would not exceed the 60-dBA speech interference criterion at the closest residential receptors, a less-than-significant impact.

Nighttime Construction Activities

Lower Crystal Springs Dam Vicinity

While almost all construction activities would occur during the day and swing shifts (approximately 6 a.m. to 10 p.m.), there might be instances when concrete pours would occur at the toe of the dam during the night shift (approximately 10 p.m. to 6 a.m.) due to the tight construction schedule proposed.[4] These concrete pours would entail the use of concrete mixing trucks and concrete pumps at the toe of the dam as well as at the south end of the top of the dam. No other construction activities are proposed to occur during the night shift at the LCSD site. The corresponding noise levels at the closest receptors were estimated based on the approximate minimum distances to the stilling basin at the toe of the dam and south end of the top of the dam. **Table 5.7-7** presents estimated nighttime noise levels at the closest sensitive receptors to the LCSD (residences at the west end of Berryessa Way and on Laurel Hill Drive) as well as more distant residential receptors on West Point Place and Tarrytown Street.

As indicated in Table 5.7-7, nighttime operations would exceed the 50-dBA sleep interference threshold at the closest residential receptors to the east, a *significant* impact. Construction-related noise would also exceed nighttime ambient noise levels at these receptors, indicating that construction noise could be audible despite the freeway-dominated noise environment at these receptors. With implementation of Mitigation Measure M-NO-1 (Administrative and Source Controls), mitigated combined noise levels would still exceed the 50-dBA sleep interference threshold. When compared to average ambient noise levels in Table 5.7-7, mitigated combined noise levels could approach, but would not exceed, the average ambient nighttime noise levels at the closest receptors to the northeast, while periodically meeting or slightly exceeding average ambient levels at the closest receptors to the southeast. Mitigated combined noise levels would exceed the minimum nighttime noise levels at these two locations (see Table 5.7-2 for the minimum nighttime noise levels measured). In addition, mitigated combined noise levels would exceed average and minimum nighttime noise levels at more distant residential receptors to the southeast (West Point Place and Tarrytown Street vicinities). Such exceedances indicate that mitigated construction noise levels would be audible during the quietest hours of the night at residential receptors located to the northeast and southeast, despite the residential noise environment being higher in the vicinity of I-280. Therefore, mitigated noise levels would be *significant and unavoidable.*

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[4] Construction in the spillway and stilling basin vicinity can only occur during the dry season (April 15 and October 15), and therefore, construction activities may need to extend into the nighttime hours (beyond the two work shifts proposed) in order to complete construction in this vicinity prior to the onset of the rainy season. From a dam safety perspective, it is critical to have a functioning spillway and stilling basin during the rainy season to control the reservoir water releases (URS, 2009).

TABLE 5.7-7

ESTIMATED NIGHTTIME CONSTRUCTION NOISE LEVELS AT THE CLOSEST SENSITIVE RECEPTORS TO LCSD

Receptor Location and Project Facility	Maximum Noise Source	Reference Hourly Leq in dBA at 50 feet[a]	Minimum Distance Between Closest Receptor and Project[b]	Distance Adjustment	Adjusted Leq	Exterior Sleep Interference Criterion	With Mitigation Measure M-NO-1	Mitigated Leq	Nighttime Ambient Noise Level	Ordinance Nighttime Noise Limit
Noise Levels at Closest Residential Receptors to the Northeast (Minimum Distance from Noise Sources to Residences on Berryessa Way)										
Stilling Basin at Toe of Dam	4 Concrete Mixers	91	1,000	-26	65	50	-10	55	59	58
	2 Concrete Pumps	85	1,000	-26	59	50	-7	52	59	
	Backup Beepers	85-115 (Lmax)	1,000	-26	59-89 (Lmax)	50	0	59-89 (Lmax)	59	
Top of Dam	1 Concrete Mixer	85	1,350	-29	56	70	-7	49	59	
	Backup Beepers at Staging Area 8	85-115 (Lmax)	1,350	-29	56-86 (Lmax)	50	0	56-86 (Lmax)	59	
	COMBINED LEVEL	93			**66**	50		**57**	59	
Noise Levels at Closest Residential Receptors to the Southeast (Minimum Distance from Noise Sources to Residences on Laurel Hill Drive)										
Stilling Basin at Toe of Dam	4 Concrete Mixers	91	1,450	-29	62	50	-10	52	53	58
	2 Concrete Pumps	85	1,450	-29	56	50	-7	49	53	
	Backup Beepers	85-115 (Lmax)	1,450	-29	56-86 (Lmax)	50	0	56-86 (Lmax)	53	
Top of Dam	1 Concrete Mixer	85	1,400	-29	56	70	-18	38	53	
	Backup Beepers at Staging Area 8	85-115 (Lmax)	1,400	-29	56-86 (Lmax)	50	-18 (Attenuation from Intervening Hill)	38-68 (Lmax)	53	
	COMBINED LEVEL	93			**64**	50		**54**	53	
Noise Levels at Closest Residential Receptors to the Southeast (Minimum Distance from Noise Sources to Residences on Tarrytown Street)										
Stilling Basin at Toe of Dam	4 Concrete Mixers	91	2,700	-38	53	50	-10	43	42	58
	2 Concrete Pumps	85	2,700	-38	47	50	-7	40	42	
	Backup Beepers	85-115 (Lmax)	2,700	-38	47-77 (Lmax)	50	0	47-77 (Lmax)	42	
Top of Dam	2 Concrete Pumps	85	2,760	-38	47	70	-18	29	42	
	Backup Beepers at Staging Area 8	85-115 (Lmax)	2,760	-38	47-77 (Lmax)	50	-18 (Attenuation from Intervening Hill)	29-59 (Lmax)	42	
	COMBINED LEVEL	93			**55**	50		45	42	

NOTES: Noise levels in BOLD exceed the 50-dBA sleep interference criterion.

[a] Reference noise levels represent noise levels for similar equipment types (without controls) listed in Table 5.7-5 at 50 feet. These estimates assume that specified equipment would be operated 100 percent of the time at full throttle at the closest possible distance to the receptor. While unlikely to occur, this worst-case assumption is intended to offset the various distances of other pieces of equipment operating in the vicinity with variable throttle speeds and durations during any given hour.

[b] Distances represent the minimum distance between the receptor and the closest construction activity. Distances between a given receptor and multiple equipment noise sources would vary, so combined noise levels are considered very conservative since they assume all equipment would operate at the same closest location.

SOURCE: Orion Environmental Associates, 2009.

Sampling Station #5 Vicinity

Construction activities at the Sampling Station #5 site would occur only during weekdays and during daytime hours (typically between 7 a.m. and 5 p.m.). Thus, because no nighttime construction would occur at the sampling station site, no impact related to nighttime construction noise would result and therefore, this impact is *not applicable.*

In addition to noise associated with equipment operation, nearby residential receptors would also be subject to noise from backup alarms on concrete trucks, which could be particularly disturbing during the nighttime hours. There are two locations where backup alarms could be used: (1) at the toe of the dam where maneuvering of concrete trucks in the stilling basin vicinity could require backing up; and (2) the section of Skyline Boulevard south of the dam (Staging Area 8) where concrete trucks area would back up for approximately 900 feet. Noise generated by backup alarms at both the toe and top of the dam were estimated for the closest residential receptors and are presented in Table 5.7-7.

As indicated in this table, backup alarms operated at the toe of the dam (stilling basin vicinity) could exceed ambient noise levels at the closest residential receptors to the northeast and southeast, which would be audible at these receptors. Given the 30-dBA range in noise levels associated with backup alarms, alarm-related noise levels could either meet ambient noise levels at the lower end of the range or exceed ambient noise levels by as much as 33 dBA at the upper end of the range. If alarms exceed ambient noise levels, they could be audible at the closest receptors, particularly since these alarms have a higher frequency noise than freeway traffic noise (i.e., the alarms are intended to contrast with ambient noise levels). Therefore, the use of backup alarms at the toe of the dam would constitute a *potentially significant* impact on residential receptors located to the northeast and southeast of the proposed stilling basin. Since backup alarms for haul trucks must be audible above the surrounding ambient noise level at a distance of 200 feet and ambient noise levels are typically low during the nighttime hours, it is possible that noise levels generated by backup alarms could be at the lower end of the range.

Table 5.7-7 also presents noise level estimates for backup alarms operated at the top of the dam (Skyline Boulevard, Staging Area 8). As shown in this table, existing topography would block or attenuate alarm noise for residents in the neighborhood located east of this staging area (east of I-280) and south of Crystal Springs Road. However, depending on the loudness of the alarms, it is possible that alarms could exceed ambient noise levels and could still be audible. In addition, there are approximately five residences located northeast of the dam (north of Crystal Springs Road in the vicinity of Berryessa Way, Pilarcitos Way, and Lakeview Drive) that would have a direct line-of-sight to the northernmost end of Skyline Boulevard (just south of the dam) where backup alarms would operate. Given the 30-dBA range in noise levels associated with backup alarms, alarm-related noise levels would either not exceed ambient noise levels at the lower end of the range or exceed ambient noise levels by as much as 27 dBA at the upper end of the range. Therefore, noise impacts related to the operation of backup alarms at the top of the dam would be *potentially significant* for residential receptors located northeast of the dam.

Several new alarm technologies are currently under review by the California Department of Occupational Safety and Health (Cal-OSHA). Alarm devices known as "smart alarms" measure the ambient noise level and adjust their output accordingly, and "broadband alarms" produce what is known as white sound.[5] The use of smart alarms or broadband alarms, or other restrictions listed under Mitigation Measure M-NO-1e (Administrative and Source Controls, 5th performance measure), could be utilized to reduce the potential for annoyance effects. However, it is not known whether these alarms could be feasibly implemented because they would have to be approved by Cal-OSHA prior to construction and the contractor would have to determine that such alarms would not present heightened safety risks. Due to these uncertainties, this impact would be *significant and unavoidable.*

Impact NO-2: Consistency with noise ordinance limits.

Lower Crystal Springs Dam Vicinity

Project construction at the LCSD site would occur during the day shift, approximately 6 a.m. to 2 p.m. and during the swing shift, approximately 2 p.m. to 10 p.m. (weekdays or weekends) over the entire nine-month construction duration. However, a night shift (approximately 10 p.m. to 6 a.m.) would be utilized as necessary for at least part of the time (up to six months) to meet the construction schedule. When compared to the San Mateo County Noise Ordinance time limits (7 a.m. to 6 p.m. on weekdays, and 9 a.m. to 5 p.m. on Saturdays), the proposed daytime shift would start one hour before the ordinance time limits, while the swing shift would extend four hours after the weekday time limit and five hours after the Saturday time limit. Proposed nighttime construction would occur beyond both weekday and weekend time limits. If any construction were to occur on Sundays, it would also conflict with ordinance time limits, which prohibits construction on Sundays.

Proposed nighttime construction would occur beyond weekday and weekend time limits set in the San Mateo County Noise Ordinance due to the tight construction schedule,[6] and therefore this document analyzes whether nighttime work would be consistent with local ordinance noise limits for equipment operating beyond the time limits. The San Mateo County Noise Ordinance specifies noise limits for the operation of any mechanical equipment. The ordinance's equivalent Leq noise limit is calculated to be 58 dBA (Leq) for any equipment operating between 10 p.m. and 7 a.m. As indicated in Table 5.7-7, estimated combined construction noise levels would exceed the 58-dBA (Leq) ordinance noise limit, a *significant* impact. With implementation of Mitigation Measure M-NO-1 (Administrative and Source Controls), mitigated noise levels would be reduced to below the ordinance noise limit, and potential conflicts with the San Mateo County Noise

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[5] Broadband sound, also known as "white sound," is composed of all frequencies in the audio spectrum. White sound has the unique characteristic that its source can be instantly locatable. Because white sound is multi-frequency, it does not rely on high sound pressure (decibels) to be heard, and competing, single frequencies cannot mask it. As a result, a white sound alarm is as effective at lower decibels as the outmoded single-frequency alarms.

[6] Construction in the spillway and stilling basin vicinity can only occur during the dry season (April 15 and October 15). From a dam safety perspective, it is critical to have a functioning spillway and stilling basin during the rainy season to control the reservoir water releases (URS, 2009).

Ordinance noise limits would be reduced to a less-than-significant level. Although nighttime construction would occur beyond the time limits of the San Mateo County Noise Ordinance, noise controls (Mitigation Measure M-NO-1) would lower nighttime construction noise levels at county residential receptors to below the 58-dBA Leq equivalent noise limit, thus reducing the impact to a less-than-significant level (consistent with the ordinance noise limit).

Sampling Station #5 Vicinity

Construction activities at the sampling station site would last for about four months and are assumed to require only one shift per day, typically between 7 a.m. and 5 p.m., with no nighttime construction. Assuming no construction would take place on Sundays, construction activities would be consistent with the San Mateo County Noise Ordinance time limits (7 a.m. to 6 p.m. on weekdays, and 9 a.m. to 5 p.m. on Saturdays). Since proposed construction would be consistent with ordinance time limits, ordinance noise limits would not apply. Therefore, construction activities at Sampling Station #5 would be consistent with ordinance limits, and the impact would be *less than significant*.

Impact NO-3: Temporary noise disturbance along construction haul routes.

Truck noise levels depend on vehicle speed, load, terrain, and other factors and the effects of construction-related truck traffic would depend on the level of background noise already occurring at a particular receptor site. In quiet noise environments such as residential neighborhoods protected by freeway sound walls (Leq averaging 50 dBA), one truck per hour would be noticeable, even though such a low volume would not measurably increase noise levels. In slightly noisier environments such as the freeway interchange vicinity in front of sound walls (Leq averaging 60 dBA), the threshold level is higher, and 10 trucks per hour would be required to noticeably increase the noise exposure. In moderately noisy environments (Leq averaging 70 dBA), a noise increase would be perceptible with the addition of 100 trucks per hour (Caltrans, 1998).

In quiet environments or during quieter times of the day, truck noise is mainly a single-event disturbance; although the hourly average noise level associated with short single events is not very high, individual noise peaks of 80 to 85 dBA at 50 feet are common during a truck passage. However, in noisy environments or during less noise-sensitive hours, truck noise is perceived as part of the total noise environment rather than as an individual disturbance. Therefore, this analysis estimated noise levels associated with hourly haul truck volumes (rather than a single passing truck); these noise estimates are presented below.

Lower Crystal Springs Dam Vicinity

Haul truck volumes associated with the proposed project would vary from day to day, with the highest volumes generally occurring during the excavation, concrete placement, and backfilling stages of facility construction. When haul truck noise is considered on an hourly basis rather than as a single noise event, noise levels generated by estimated average and peak hourly construction and worker vehicle traffic could reach 64 dBA CNEL, with maximum hourly noise levels of 62 dBA Leq during the day and 59 dBA Leq during the night at 50 feet from the roadway centerline. Construction vehicles would access the LCSD project site via three possible routes: (1) I-280 to Hayne Road to Skyline Boulevard to Crystal Springs Road (the toe or top of the dam accessible from this route); (2) I-280 to Bunker Hill Drive to Skyline Boulevard to the south end of the top of the dam; or (3) I-280 to Highway 92 to Polhemus Road to Crystal Springs Road. Larger trucks would need to use the second and third routes because of turning-radius limitations when vehicles turn right from Crystal Springs Road into the site access road at the toe of the dam.

Estimated traffic noise levels would not exceed the 70-dBA speech interference criterion during the daytime or evening hours (7 a.m. to 10 p.m.) at 50 feet from the roadway, but they would exceed the 50-dBA sleep interference criterion during the nighttime (10 p.m. to 6 a.m.) at this distance. The closest residential receptors are approximately 450 feet from the Hayne Road/I-280 northbound off-ramp (first access route), 800 feet from the Bunker Hill Drive/I-280 off-ramp (second access route), and 60 feet from the centerline of Polhemus Road (third access route). At these distances, nighttime traffic noise would not exceed the 50-dBA sleep interference threshold at the closest receptors to the first and second access routes, and would likely not exceed minimum ambient noise levels at these receptors. However, noise levels along Polhemus Road would exceed the 50-dBA threshold at 85 feet from the centerline of this road, and could exceed minimum nighttime noise levels at the closest receptors to this route, a *significant and unavoidable* noise impact.

Due to the large number of sensitive receptors located along Polhemus Road, variable exposure of these receptors to this road (due to topography), and temporary nature of this noise impact, the only measures that could be implemented to reduce nighttime truck noise would be to reduce the number of trucks operating at night or construct noise walls. Reducing nighttime truck operations would not be feasible since trucks must be operated at night in order to meet the tight construction schedule. Provision of noise walls would cause significant, permanent visual and biological impacts since removal of a substantial number of mature trees would be required to accommodate noise walls along this roadway. The permanent adverse impacts that would result from these mitigation measures would be greater than the short-term temporary noise impact that would occur from nighttime truck operations.

Sampling Station #5 Vicinity

As described in Section 5.6, Transportation and Circulation, it is estimated that the maximum number of haul and delivery vehicles traveling to and from the site would be about three roundtrips per day, or about six individual trips per day. Spread over the course of the day, this would be less than one trip per hour; therefore, any increase in noise along haul routes would be minimal, and the impact would be *less than significant*.

Impact NO-4: Noise disturbance due to construction-related blasting.

Lower Crystal Springs Dam Vicinity

As described in the Chapter 3, Project Description, Section 3.6.4, Construction Activities at the Toe of the Dam, controlled detonations (blasting) could be required during excavation of the stilling basin at the LCSD site and would be used only when conventional methods for excavating in rock are not practical.[7] If needed, controlled blasting would be performed from 7 a.m. to 5 p.m., Monday through Friday. Typically, there would be one to two blasts per day; however, if contractors determine it is necessary to conduct blasting during the daytime and swing shifts, there would be two to three blasts per day.

Blasting would be performed by drilling 1.5-inch-diameter holes in a pattern determined by the blasting specialist. The holes would be filled with a specified amount of explosives and wired for detonation. Once the area is prepared, a chain-link fence and a blast mat (rubber belting) would be placed over the area. Warning horns (110 dBA Lmax at 50 feet) would sound before detonation. The entire detonation of a typical blast would be less than a few seconds. Once a blast is over, an all-clear horn would be sounded.

Blasting could occur in the stilling basin area; the closest residential receptor is located approximately 1,000 feet to the east, where blasting activities could generate 2-second peak noise events of approximately 112 dBA Lmax two or three times per day over five to six weeks. At this distance, warning horns would generate noise levels of 84 dBA Lmax. Since both the horns and blasting noise levels would exceed the existing daytime ambient noise level of 66 dBA Leq at the closest receptors, these peak noise events would be audible at the closest residential receptors. In addition, these noise events would exceed the San Mateo County Noise Ordinance noise limits[8] (an instantaneous maximum noise event of 75 dBA during any given hour) by up to 37 dBA at the closest residential receptors; therefore, the potential for disturbance of the closest residential receptors from this activity would be a *significant* noise impact.

The estimated 112 dBA (Lmax) is likely an over-prediction because it does not account for any atmospheric absorption, intervening topographic barrier effects, and the frequency of the noise (low-frequency noise is not absorbed by the atmosphere as well as higher frequency noise). Nevertheless, blasting activities could generate peak noise events resulting in momentary speech interference effects (2 seconds) that are up to 42 dBA above the 70-dBA speech interference threshold two or three times per day. Modifying blast charges as prescribed under Mitigation Measure M-NO-4 (Blasting Noise Controls) would reduce noise levels to 101 dBA at 50 feet, thereby reducing blasting noise impacts to a less-than-significant level. Alternatively, if blasting charges cannot be reduced sufficiently, then reducing the frequency of blasting (the number of blast events during any given hour) could meet the 70-dBA (Leq) speech interference criterion.

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[7] If conventional methods cause construction delays because construction work in the spillway and stilling basin must be completed during the dry season to ensure dam safety (i.e., spillway and stilling basin must be functional during the rainy season to control the reservoir water releases).

[8] San Mateo County Noise Ordinance noise limits were applied in this analysis to both Hillsborough residential receptors to the northeast as well as San Mateo County residential receptors to the southeast because Hillsborough's Noise Ordinance does not contain noise limits that are applicable to this type of noise.

Sampling Station #5 Vicinity

Construction-related blasting would not occur in the Sampling Station #5 vicinity. Therefore, no impact related to blasting during construction activities would occur at this site and this impact is *not applicable.*

Impact NO-5: Temporary disturbance due to construction-related vibration.

Lower Crystal Springs Dam and Sampling Station #5 Vicinities

Construction of the proposed project could cause vibration that would disturb local residents or cause cosmetic damage to buildings and structures. In general, cosmetic or threshold damage to residential buildings can occur at vibration levels that exceed 0.5 in/sec PPV. The U.S. Bureau of Mines specifies a threshold cracking criterion of 2.0 in/sec PPV for high frequencies (Wilson Ihrig & Associates, 2007). This level is consistent with the Federal Transit Administration's (U.S. Department of Transportation, Federal Transit Administration, 2006) recommended vibration threshold criterion of 0.2 in/sec for fragile buildings. Much lower vibration levels (exceeding 0.012 in/sec PPV) can cause disturbance or annoyance, and this threshold is typically applied to construction activities during the more sensitive nighttime hours. Exceedance of this annoyance threshold at night could result in sleep disturbance, depending on proximity to the receptor.

Based on these criteria, the following significance thresholds were established in the WSIP Program EIR (San Francisco Planning Department, 2008) and are also applied in this analysis:

- Vibratory equipment and impact pile drivers: 0.2 in/sec PPV
- Activities causing annoyance (pertains to nighttime construction only): 0.012 in/sec PPV

Vibration levels generated by large bulldozers and loaded trucks are estimated at approximately 0.010 to 0.011 in/sec PPV at 100 feet (San Francisco Planning Department, 2008), which would not exceed the above daytime or nighttime significance thresholds for vibration. Since the closest residential receptors to the LCSD site are approximately 1,000 feet away and more than a mile from the Sampling Station #5 site, vibration levels generated by these activities would be substantially lower than predicted levels at 100 feet; therefore, vibration levels would be well below the daytime and nighttime significance thresholds, and the impact would be *less than significant.*

As described above, if conventional excavation and demolition methods are inadequate, project construction at the LCSD stilling basin site could involve controlled detonations (blasting) to break apart rock or concrete, which would also generate vibration. Such blasting could occur at the toe of the dam during excavation of the stilling basin during the daytime hours (7 a.m. to 5 p.m.), with approximately two to three blasts per day.[9] Blasting could generate vibration levels of approximately 0.02 in/sec PPV at 2,000 feet or 0.06 in/sec PPV at 1,000 feet for charge weights up to 20 pounds per delay (WIA, 2009). The closest residential receptors are located a minimum of 1,000 feet from the stilling basin vicinity. At this distance, vibration generated by the proposed low-velocity blasting would be well below the threshold for cosmetic damage to fragile structures (0.2 in/sec PPV). In addition, given the infrequency of blasting events, the limited duration when blasting could occur (approximately two to three months), and the fact that blasting would occur during the daytime hours, the vibration impact on the closest residential receptors to the east associated with proposed blasting would be *less than significant.*

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[9] With excavation occurring during the day and swing shifts, a potential blasting work schedule would require drilling until 7 a.m. and blasting shortly after 7 a.m. This would be followed by excavation and one more drill/blast cycle before 5 p.m., with excavation and drilling continuing after 5 p.m.

However, there is fish habitat (Pool 2) in San Mateo Creek located as close as 220 to 330 feet from the proposed stilling basin, while the closest spawning area is approximately 2,000 feet away. Groundborne vibration generated by potential blasting activities would transfer energy to the creek, generating peak underwater sound pressure levels of 185 to 205 dB, with typical SEL[10] values of 157 to 185 dB for charge weights up to 20 pounds per delay. Such levels would not exceed criterion limits imposed by the National Marine Fisheries Service (WIA, 2009). The impacts of such underwater noise levels on aquatic species are discussed in Section 5.13, Biological Resources, Impact BI-12.

5.7.3.5 Operational Impacts

Impact NO-6: Disturbance due to noise and vibration increases associated with operation and maintenance of project facilities.

Lower Crystal Springs Dam and Sampling Station #5 Vicinities

After completion of construction activities, operation and maintenance of the LCSD and Sampling Station #5 would not introduce any new sources of noise. The primary sources of noise typically associated with the operation of water facilities include pumps and electrical facilities (substations, transformers, and emergency generators). No such noise sources would be added as part of project implementation. Proposed maintenance activities would include cleaning the stilling basin twice a year, which would require use of pumps and other mechanical devices. However, because there are no noise-sensitive uses in the immediate vicinity and such operations would be extremely limited in duration, proposed project operations and maintenance would be *less than significant*.

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[10] Sound Exposure Level (SEL) is a metric that quantifies the sound energy for a given event, normalized to a 1-second duration.

5.7.3.6 Mitigation Measures

Mitigation Measure M-NO-1: Administrative and Source Controls.

The SFPUC shall include in construction contract specifications a requirement to prepare a noise control plan. The contractor shall submit a noise control plan, prepared by a qualified noise consultant, to the SFPUC for review and approval at least 21 days before the start of mobilization or construction. The SFPUC shall require the noise consultant to be a board-certified Institute of Noise Control Engineering member or other qualified consultant or engineer, to be approved by the SFPUC project construction manager. The noise control plan shall contain performance standards based on speech (70 dBA, Leq) and sleep (50 dBA, Leq) interference thresholds as appropriate, but these thresholds shall be adjusted to reflect existing ambient noise levels as necessary. At a minimum, the plan shall contain the following measures to maintain noise levels at or below these performance standards:

a. Best available noise control techniques (including mufflers, intake silencers, ducts, engine enclosures, and acoustically attenuating shields or shrouds) shall be used for all equipment and trucks as necessary in order to minimize construction noise impacts.

b. If impact equipment (e.g., concrete/rock breaker, rock drill) is used during project construction, hydraulically or electric-powered equipment shall be used wherever feasible to avoid the noise associated with compressed-air exhaust from pneumatically powered tools. However, where the use of pneumatically powered tools is unavoidable, an exhaust muffler on the compressed-air exhaust shall be used where necessary (a muffler can lower noise levels from the exhaust by up to about 10 dBA). External jackets on the tools themselves shall be used, where feasible, which could achieve a reduction of 5 dBA. Quieter procedures, such as drilling rather than impact equipment, shall be used whenever feasible.

c. Adequate muffling (with enclosures where feasible and appropriate) shall be used on all stationary equipment as necessary to ensure local noise ordinance limits are met to the extent feasible. Enclosure openings or vents shall face away from sensitive receptors to the east (at the toe of the dam) and north (at the top of the dam). If any stationary equipment (e.g., fans, generators, or pumps) is operated beyond the time limits specified by the San Mateo County and Hillsborough noise ordinances, this equipment shall conform to the 50-dBA sleep interference threshold, adjusted to reflect ambient noise levels.

d. Material stockpiles as well as maintenance/equipment staging and parking areas shall be located as far from the closest residential and recreational receptors as possible.

e. To minimize noise impacts associated with backup alarms: (1) smart or broadband alarms shall be utilized wherever feasible, if they have been approved by Cal-OSHA at the time of construction and the contractor determines such alarms would not present heightened safety risks; (2) haul and delivery routes, as well as stockpile locations, shall be configured in all staging areas where possible to minimize the use of backup alarms; and (3) operation of equipment requiring the use of backup beepers shall be avoided to the extent feasible during nighttime hours (10 p.m. to 7 a.m.).

f. A designated project liaison shall be responsible for responding to noise complaints during the construction phases. The name and phone number of the liaison shall be conspicuously posted at construction areas and on all advanced notifications. This person shall take steps to resolve complaints, including conducting periodic noise monitoring, if necessary. Results of noise monitoring shall be presented at regular project meetings with the project contractor, and the liaison shall coordinate with the contractor to modify any construction activities that generate excessive noise levels to the extent feasible.

g. In the event of noise complaints, the contractor shall provide information to the SFPUC within 48 hours of being notified of the complaint regarding the noise levels measured and activities that correspond to the complaints. The SFPUC shall compare the noise levels to the information provided in the noise control plan, and if necessary, the effectiveness of implemented noise control measures shall be verified by the contractor. The contractor shall be responsible for the correct installation and use of all implemented noise control measures and for complying with noise specifications.

Mitigation Measure M-NO-4: Blasting Noise Controls.

The noise control plan shall specify that initial blasting activities be monitored to determine if blasting-related peak noise events exceed the San Mateo County Noise Ordinance noise limit of 75 dBA (Lmax) at the closest residential receptors. If blasting noise levels are found to exceed this limit, blasting charges shall be modified to the extent feasible to be consistent with these noise limits, which would require blasting charges to be reduced so that noise levels do not exceed 101 dBA (Lmax) at 50 feet from the closest sensitive receptors. Alternatively, if blasting charges cannot be reduced sufficiently, then the frequency of blasting (i.e., the number of blast events during any given hour) shall be reduced to meet San Mateo County Noise Ordinance noise limits.

5.7.3.7 Cumulative Impacts

Impact C-NO: Cumulative increases in construction noise in the dam vicinity and along construction haul and delivery routes.

The geographic scope of potential cumulative noise impacts encompasses the LCSD vicinity as well as areas adjacent to the LCSDI access and haul routes that are located near noise-sensitive land uses.

Lower Crystal Springs Dam Vicinity

As indicated in Section 5.1, Overview, Table 5.1-1 and Figure 5.1-2, construction of the following five projects could overlap geographically and/or occur concurrently with LCSDI construction activities in this area:

- San Mateo County's Crystal Springs Dam Bridge Replacement
- SFPUC's Crystal Springs/San Andreas (CSSA) Transmission Upgrade
- SFPUC's Crystal Springs Pipeline No. 2 (CSPL2) Replacement – Sites 1 and 2

- SFPUC's New Crystal Springs Bypass Tunnel (NCSBT) – South Shaft
- SFPUC's Habitat Reserve Program (HRP)

One of the primary cumulative noise effects of multiple, overlapping construction projects would be the extended duration of construction in the LCSD/Crystal Springs Road vicinity, where residents would be subject to construction noise for approximately three to four years (2010 through 2014). Construction activities for the LCSDI project and the Crystal Springs Dam Bridge Replacement project would be performed sequentially and would result in construction disruption at the same location for approximately 32 months. Construction of the CSSA Transmission Upgrade project is scheduled to overlap with the LCSDI project in the vicinity of the toe of the dam, and cumulative noise increases could result from concurrent construction activities in this area. It is also possible that pipeline replacement work at CSPL2 Site 1 would overlap with LCSDI construction in this vicinity if it occurs in 2011 instead of 2012. Construction of the CSSA Transmission Upgrade project is estimated to require three years, beginning in fall 2010 and ending in fall 2013, while work at CSPL2 Site 1 would be completed in approximately three months (between summer and fall in either 2011 or 2012). In general, the CSSA Transmission Upgrade project and the CSPL2 Replacement project would be constructed during the daytime hours (dawn until dusk), Monday through Saturday. Nighttime work associated with the CSSA Transmission Upgrade project could be required in the vicinity of the Crystal Springs Pump Station, which is located near the toe of the dam. Cumulative noise increases could result if construction noise generated by the CSSA Transmission Upgrade project and CSPL2 Replacement project were to occur at the same time as noise generated by LCSDI construction activities. Since construction noise from the LCSDI project alone is estimated to exceed the 70-dBA speech interference threshold at the closest residential receptors to the northeast and southeast of the dam, the combined noise increases from the LCSDI project in conjunction with the CSSA Transmission Upgrade project and the CSPL2 Replacement project (which are located slightly closer to residential receptors to the east) would likewise be expected to exceed this threshold. Similarly, nighttime construction activities associated with both the LCSDI project and the CSSA Transmission Upgrade project would likely exceed the 50-dBA sleep interference threshold, particularly since the LCSDI nighttime construction activities would already exceed this threshold. Therefore, the proposed project's contribution would be cumulatively considerable, and cumulative noise increases are considered to be a *significant* impact.

While implementation of noise controls (Mitigation Measure M-NO-1) would reduce most of the project's contribution to this potential cumulative impact,[11] cumulative noise increases could still occasionally occur due to overlapping construction activities in the same area. Mitigation Measure M-C-NO (Coordinated Noise Control Plan) would require that a coordinated noise control plan be prepared and appropriate noise controls be outlined to ensure that combined noise levels would not exceed the 70-dBA speech interference and 50-dBA sleep interference thresholds to the maximum extent possible. It is expected that daytime construction noise could be coordinated to maintain noise levels at the closest residential receptors at or below the 70-dBA speech interference threshold. However, since construction activities associated with both the

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[11] One exception would be project construction activities that occur beyond the time limits specified in the Town of Hillsborough Noise Ordinance (see Impact NO-2 for more discussion).

LCSDI project and the CSSA Transmission Upgrade project would include construction during the nighttime hours, it is possible that noise controls, even if coordinated, would not be able to consistently maintain construction noise below the 50-dBA sleep interference threshold or below ambient noise levels.[12] Therefore, even with implementation of a coordinated noise control plan (Mitigation Measure M-C-NO), cumulative noise increases could still exceed these thresholds. Therefore, the project's contribution could be cumulatively considerable, and the impact would be *potentially significant and unavoidable.*

Sampling Station #5 Vicinity

The construction of project improvements at Sampling Station #5 would last for about four months, between spring and fall of 2011. However, construction activities could overlap with three smaller improvement and repair projects planned in the Sampling Station #5 vicinity (Pulgas Discharge Channel Modifications, Pulgas Structure Rehabilitation and Roof Replacement, and Pulgas Modification of Existing Dechloramination Facility). The only sensitive receptor in this vicinity is the Pulgas Water Temple, and cumulative construction noise increases in this area could disrupt scheduled events at the water temple. However, implementation of Mitigation Measure M-LU-1b (Event Scheduling at the Pulgas Water Temple) in Section 5.2, Land Use, which restricts special events at the water temple during proposed construction, would reduce the project's impact so that its contribution would be less than cumulatively considerable (*less than significant*).

In addition, LCSDI project's construction-related traffic along Cañada Road combined with the traffic from the Pulgas Discharge Channel Modifications project, Pulgas Structure Rehabilitation and Roof Replacement project, and Pulgas Modification of Existing Dechloramination Facility project could result in noticeable cumulative noise increases. The closest sensitive receptor along this roadway is the Pulgas Water Temple, which is located approximately 500 feet from Cañada Road (see Section 5.10, Recreation, for an analysis of impacts on other recreational uses). Such a setback is sufficient to ensure that cumulative traffic noise levels would not exceed the 60-dBA speech interference threshold for passive outdoor uses. Therefore, these temporary combined traffic noise increases could be noticeable at times at the Pulgas Water Temple, but would be less than cumulatively considerable (*less than significant*).

Access and Haul Routes

Construction activities associated with the LCSDI project in combination with construction of other cumulative projects in the Peninsula watershed could result in cumulative increases in traffic on construction routes along Skyline Boulevard, Crystal Springs Road, Polhemus Road, Highway 92, and I-280 due to construction vehicles and construction worker vehicles. Freeway routes such as Highway 92 and I-280 have higher ambient noise levels than local residential streets, and therefore, cumulative traffic increases on these freeways are not expected to significantly alter ambient noise levels in their vicinities. However, based on cumulative traffic increases associated with the combined construction vehicles from multiple projects using the same access and haul routes, cumulative traffic noise increases of up to 4 dBA could occur along Crystal Springs Road (near Polhemus Road) and on Polhemus Road during peak traffic hours, while cumulative increases of up to 6 dBA could occur on Crystal Springs Road near Skyline Boulevard.

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[12] Since freeway noise dominates the noise environment and existing ambient noise levels during the nighttime hours already exceed the 50-dBA threshold at the closest residential receptors (see Table 5.7-2), the threshold at these receptors would need to be adjusted upward to reflect the existing freeway noise environment.

Noise increases along Crystal Springs Road near Skyline Boulevard would be readily noticeable during peak traffic periods, but residential receptors are more than 200 feet from this section of road, which would ensure that traffic noise levels would not exceed the 70-dBA speech interference threshold at the closest residential receptors. Traffic noise increases in the Crystal Springs Road/Skyline Boulevard vicinity would, however, be noticeable to recreationists using the Sawyer Camp Trail. Cumulative traffic noise levels adjacent to this intersection would likely exceed the 60-dBA speech interference threshold (for passive recreational uses) in the trailhead vicinity. However, since this trail is located away from this intersection and recreationists would only be subject to these increases near the trailhead, the effect of this cumulative noise increase would be less than cumulatively considerable (*less than significant*). Section 5.10, Recreation, provides further discussion of impacts on recreationists.

Farther east, cumulative traffic noise increases of 4 dBA or less along Crystal Springs Road (near Polhemus Road) and along Polhemus Road (south of Crystal Springs Road) during peak periods would be barely perceptible to most people and are not expected to exceed the 70-dBA speech interference threshold at 50 feet. Since residential receptors along these streets are more than 50 feet from these roadway centerlines, cumulative peak-period traffic noise levels would not exceed the 70-dBA speech interference threshold at the closest receptors. Therefore, potential cumulative noise increases resulting from cumulative increases in daytime traffic along construction routes would be less than cumulatively considerable (*less than significant*).

The potential for cumulative traffic noise increases to occur along construction routes during the nighttime hours would depend on each project's nighttime construction activities. Regardless of the extent of cumulative nighttime noise increases associated with other identified projects, the project's nighttime noise impact on Polhemus Road would be significant and unavoidable. Therefore, the project's contribution to potential nighttime noise increases on this road would be cumulatively considerable. Even with implementation of Mitigation Measure M-C-NO (Coordinated Noise Control Plan), cumulative noise increases on Polhemus Road during the nighttime hours could still exceed these thresholds, and this cumulative impact would be *potentially significant and unavoidable.*

Vibration

Construction of the CSSA Transmission Upgrade project and the CSPL2 Replacement project in the LCSD vicinity could generate vibration near the Crystal Springs Pump Station at the same time. Construction of the LCSDI project could further increase vibration levels in this vicinity. Vibration associated with the operation of heavy equipment would be well below threshold levels for each of these projects (0.010 to 0.011 in/sec PPV, as compared to the threshold for cosmetic damage to fragile structures of 0.2 in/sec PPV), and the combined increase in vibration from simultaneous operation of equipment is expected to remain below this threshold; therefore, vibration levels would not be cumulatively considerable at nearby residences to the east or in the Crystal Springs Pump Station vicinity. Other activities that would generate vibration include blasting and pile driving. However, blasting would only be associated with the LCSDI project, while pile driving would only be associated with the CSSA Transmission Upgrade project. Therefore, vibration associated with these other activities would not be cumulatively considerable (*less than significant*).

5.7.3.8 Cumulative Mitigation Measures

Mitigation Measure M-C-NO: Coordinated Noise Control Plan.

The SFPUC or its contractors shall prepare a coordinated noise control plan that outlines noise controls in the Lower Crystal Springs Dam vicinity to ensure that the 70-dBA speech interference threshold is not exceeded during the daytime and evening hours (7 a.m. to 10 p.m.) and the 50-dBA sleep interference threshold is not exceeded during the nighttime hours (10 p.m. to 7 a.m.), to the maximum extent possible, when the combined noise effects from the following projects are considered: LCSDI, CSSA Transmission Upgrade, and CSPL2 Replacement (Sites 1 and 2).

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5.8 Air Quality

This section addresses the air quality impacts that could result from implementation of the Lower Crystal Springs Dam Improvements (LCSDI) project. This analysis evaluates the project's consistency with air quality attainment plans and regulatory standards and estimates potential increases in criteria air pollutants and greenhouse gases (GHGs) that would be associated with project implementation.

5.8.1 Setting

5.8.1.1 Climate and Meteorology

Climate and meteorology are important considerations for air quality. Local dispersion and regional transport of air pollutants directly relate to prevailing meteorology. Diurnal, seasonal, and regional air pollution patterns are controlled by a variety of meteorological factors. Wind directions and speeds and vertical temperature structure (inversions) are the primary determinants of transport and dispersion effects.

The Lower Crystal Springs Dam (LCSD) and Crystal Springs Reservoir are located in the mid-Peninsula area of the San Francisco Bay region. California's climate is considered to be a Mediterranean type climate. This climate type is characterized by moist mild winters and dry summers. The mid-Peninsula climate is further influenced by the relatively cool waters of the Pacific Ocean on the west and San Francisco Bay on the east.

Summertime in the Bay Area is characterized by cool marine air and persistent coastal stratus and fog, with average maximum temperatures between 60 degrees Fahrenheit (°F) and 70°F, and minimum temperatures between 50°F and 55°F. Rainfall from May through September is relatively rare, with an aggregate of less than an inch, or only about 5 percent of the yearly average total of about 21.5 inches. Winter temperatures in the Bay Area are quite moderate, with highs between 55°F and 60°F and lows in the range of 45°F to 50°F.

5.8.1.2 Ambient Air Quality

The LCSD and Crystal Springs Reservoir lie entirely within the San Francisco Bay Area Air Basin (SFBAAB). Within the basin, the Bay Area Air Quality Management District (BAAQMD) operates a regional monitoring network that measures the ambient concentrations of six criteria pollutants:[1] ozone, carbon monoxide (CO), particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead. Existing and probable future air quality in the project area can be best inferred from ambient air quality measurements conducted by the BAAQMD at its closest monitoring station in Redwood City, located at 897 Barron Avenue, about 10 miles southeast of the LCSD. **Table 5.8-1** provides a four-year summary of monitoring data (2005–2008)

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[1] Commonly occurring air pollutants known to be deleterious to human health and for which extensive health-effects criteria documents are available are referred to as "criteria air pollutants."

TABLE 5.8-1
SAN FRANCISCO BAY AREA AIR BASIN AMBIENT AIR QUALITY MONITORING SUMMARY – REDWOOD CITY (2005–2008)

Pollutant	Most Stringent Applicable Standard	Number of Days Standards Were Exceeded and Maximum Concentrations Measured			
		2005	2006	2007	2008
Ozone					
Days 1-hour Standard Exceeded	>0.09 ppm[a]	0	0	0	0
Maximum 1-hour Concentration (ppm)		0.084	0.085	0.077	0.082
Days 8-hour Standard Exceeded	>0.07 ppm[a]	0	0	0	0
Days 8-hour Standard Exceeded	>0.075 ppm[b]	0	0	0	0
Maximum 8-hour Concentration (ppm)		0.061	0.063	0.069	0.069
Carbon Monoxide (CO)					
Days 1-hour Standard Exceeded	>20 ppm[a]	0	0	0	0
Maximum 1-hour Concentration (ppm)		4.5	5.5	5.5	4.3
Days 8-hour Standard Exceeded	>9 ppm[a]	0	0	0	0
Maximum 8-hour Concentration (ppm)		2.3	2.4	2.3	1.9
Nitrogen Dioxide (NO_2)					
Days 1-hour Standard Exceeded	>0.18 ppm[a]	0	0	0	0
Maximum 1-hour Concentration (ppm)		0.062	0.069	0.057	0.069
Suspended Particulates (PM_{10})					
Days 24-hour Standard Exceeded[c]	>50 µg/m^3 [a]	2	2	1	--[e]
Maximum 24-hour Concentration (µg/m^3)		80.8	69.9	56.0	--[e]
Maximum Annual Concentration (µg/m^3)	>20 µg/m^3 [a]	20.9	19.8	19.6	--[e]
Suspended Particulates ($PM_{2.5}$)					
Days 24-hour Standard Exceeded[d]	>35 µg/m^3 [b,d]	0	1	1	0
Maximum 24-hour Concentration (µg/m^3)		30.9	75.3	45.4	25.5
Annual Average (µg/m^3)	>12 µg/m^3 [a]	8.8	9.5	8.3	8.7

NOTES: **Bold** values are in excess of applicable standard. Sulfur dioxide is not monitored at this station; standards are being met for this pollutant.

ppm = parts per million
µg/m^3 = micrograms per cubic meter

[a] State standard, not to be exceeded
[b] Federal standard, not to be exceeded
[c] Based on a sampling schedule of one out of every six days, for a total of approximately 60 samples per year
[d] Federal standard was reduced from 65 µg/m^3 to 35 µg/m^3 in 2006.
[e] Monitoring of this pollutant discontinued at this station.

SOURCE: BAAQMD, 2005-2008.

from this station and compares measured pollutant concentrations with the most stringent applicable standard.

Ozone

Ozone is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROGs) and nitrogen oxide (NOx). The main sources of NOx and ROGs, often referred to as ozone precursors, are combustion processes (including motor vehicle engines) and the evaporation of solvents, paints, and fuels. Automobiles are the single largest source of ozone precursors in the Bay Area. Ozone is a regional air pollutant because its precursors are transported and diffused by wind concurrently with ozone production through the photochemical reaction process. Ozone causes eye irritation, airway constriction, and shortness of breath and can aggravate existing respiratory diseases such as asthma, bronchitis, and emphysema (BAAQMD, 1999). Table 5.8-1 shows that, according to published data, the more stringent applicable standards (state 1-hour standard of 0.09 ppm and 8-hour standard of 0.07 ppm) were not exceeded at the Redwood City monitoring station from 2005 through 2008.

Carbon Monoxide

CO is an odorless, colorless gas usually formed as the result of the incomplete combustion of fuels. The single largest source of CO is motor vehicles; the highest emissions occur during low travel speeds, stop-and-go driving, cold starts, and hard acceleration. Exposure to high concentrations of CO reduces the oxygen-carrying capacity of the blood and can cause dizziness and fatigue, impair central nervous system function, and induce angina in persons with serious heart disease (BAAQMD, 1999). As shown in Table 5.8-1, no exceedances of state CO standards were recorded at the Redwood City monitoring station between 2005 and 2008. Measurements of CO show hourly maximums ranging between 22 and 28 percent of the more stringent state standard. Similarly, maximum 8-hour CO levels range between 23 and 27 percent of the allowable 8-hour standard.

Suspended Particulates (PM_{10} and $PM_{2.5}$)

Particulate matter is a class of air pollutants consisting of solid and liquid airborne particles in an extremely small size range. Particulate matter is measured in two size ranges: PM_{10} for particles less than 10 microns in diameter, and $PM_{2.5}$ for particles less than 2.5 microns in diameter. Motor vehicles generate about half of Bay Area particulates through tailpipe emissions, brake pad and tire wear, and turbulent re-suspension of roadway dust. Wood burning in fireplaces and stoves, industrial processes, and ground-disturbing activities such as construction are other sources of fine particulates. Fine particulates are small enough to be inhaled into the deepest parts of the human lung and can cause adverse health effects. Among the criteria pollutants that the BAAQMD regulates, particulates appear to represent the most serious overall health hazard. Studies have shown that elevated particulate levels contribute to the death of approximately 200 to 500 people per year in the Bay Area. High levels of particulates have also been known to exacerbate chronic respiratory ailments, such as bronchitis and asthma, and have been associated with increased emergency room visits and hospital admissions (BAAQMD, 1999).

Diesel exhaust is a growing concern in the Bay Area and throughout California. The California Air Resources Board (CARB) identified diesel engine particulate matter as a toxic air contaminant. The exhaust from diesel engines includes hundreds of different gaseous and particulate components, many of which are toxic. Many of these toxic compounds adhere to the diesel particles, which are very small and can penetrate deeply into the lungs. Diesel engine particulate matter has been identified as a human carcinogen. Mobile sources such as trucks, buses, and automobiles are some of the primary sources of diesel emissions. Studies show that diesel particulate matter concentrations are much higher near heavily traveled highways and intersections. BAAQMD analysis shows that the cancer risk from exposure to diesel exhaust is much higher than the risk associated with any other toxic air pollutant routinely measured in the region (BAAQMD, 1999).

Table 5.8-1 shows that the state PM_{10} standard was exceeded at the Redwood City monitoring station two times each in 2005 and 2006, and one time in 2007. The annual standard was exceeded in 2005. The BAAQMD began monitoring $PM_{2.5}$ concentrations in 1999. The federal 24-hour $PM_{2.5}$ standard was exceeded once each in 2006 and 2007. The state annual average standard was not exceeded during 2005 through 2008.

Other Criteria Pollutants

The standards for NO_2, SO_2, and lead are being met in the Bay Area, and pollutant trends suggest that the SFBAAB will continue to meet these standards for the foreseeable future.

Greenhouse Gas Emissions

Gases that trap heat in the atmosphere are referred to as greenhouse gases (GHGs) because they capture heat radiated from the sun as it is reflected back into the atmosphere, much like a greenhouse. The principal GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone (O_3), and water vapor (H_2O).[2]

The accumulation of GHGs has been implicated as a driving force for global climate change. Climate change is commonly used interchangeably with "global warming" and the "greenhouse effect." Definitions of climate change vary between and across regulatory authorities and the scientific community, but in general can be described as the changing of the earth's climate caused by natural fluctuations and anthropogenic activities that alter the composition of the global atmosphere.

While the primary GHGs in the atmosphere are naturally occurring, the presence of CO_2, CH_4, and N_2O is largely the result of human activities that have accelerated the rate at which these compounds occur within the earth's atmosphere. CO_2 is the "reference gas" for climate change, meaning that emissions of GHGs are typically reported in "carbon-dioxide-equivalent" (CO_2E) measures. Emissions of CO_2 are largely by-products of fossil fuel combustion, whereas CH_4 results from off-gassing associated with agricultural practices and landfills. Other GHGs with much greater heat-absorption potential than CO_2, including hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, are generated in certain industrial processes. There is international scientific consensus that human-caused increases in GHGs have and will continue to contribute to global warming, although there is uncertainty concerning the magnitude and rate of the warming. The effects of climate change on the natural environment in California may include, but are not limited to, sea level rise, extreme heat conditions that could last longer and become more frequent, reduced snowpack, more high ozone days, more large forest fires, and more drought years. Secondary effects are likely to include a global rise in sea level, impacts on agriculture, changes in disease vectors, and changes in habitat and biodiversity.

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[2] Ozone that is not directly emitted but formed from other gases in the troposphere—the lowest level of the earth's atmosphere—also contributes to the retention of heat.

The CARB estimates that in 2006, California produced 484 million metric tons (MMT), gross, of CO_2E GHG emissions, or about 532 million U.S. tons.[3] The CARB found that transportation is the source of 38 percent of the state's GHG emissions, followed by electricity generation (both in-state and out-of-state) at 23 percent, and industrial sources at 20 percent (CARB, 20009).

In the Bay Area, fossil fuel consumption in the transportation sector (on-road motor vehicles are the single largest source of the Bay Area's GHG emissions) accounted for approximately 41 percent (41.6 MMT CO_2E) of the Bay Area's 103 million metric tons of GHG emissions in 2007. Off-road equipment sources accounted for 3 percent (2.9 MMT CO_2E) of total emissions. Industrial and commercial sources were the second largest contributors of GHG emissions, with about 34 percent (34.9 MMT CO_2E) of total emissions. Residential fuel usage accounted for about 7 percent (6.8 MMT CO_2E) of the Bay Area's GHG emissions, followed by electricity generation/ cogeneration at 15 percent (15.2 MMT CO_2E) (BAAQMD, 2008).

5.8.1.3 Sensitive Receptors

Land uses such as schools, children's daycare centers, hospitals, and convalescent homes are considered sites that are more sensitive than the general public to poor air quality because the population groups associated with these land uses have greater than normal susceptibility to respiratory distress. Persons engaged in strenuous work or exercise also have increased sensitivity to poor air quality. Residential areas are considered more sensitive to air quality conditions than commercial and industrial areas because people generally spend longer periods of time at their residences, resulting in greater exposure to ambient air quality conditions. Recreational uses or parks are also considered sensitive because of the greater exposure to ambient air quality conditions and because the presence of pollution detracts from the recreational experience (see Section 5.10, Recreation, for more discussion).

Sensitive receptors in the project vicinity include recreational users of the Sawyer Camp Trail and residential populations to the east. Sawyer Camp Trail extends northward from the Vista Point parking lot (a project staging area) along the east side of the Crystal Springs Reservoir. The trailhead is located at the intersection of Skyline Boulevard and Crystal Springs Road. Residential neighborhoods are located east of I-280, both to the north and south of Crystal Springs Road, in the town of Hillsborough and unincorporated San Mateo County, respectively. North of Crystal Springs Road, the closest residences are on Berryessa Way in Hillsborough with the closest residence approximately 500 feet northeast of the existing pump station access road and proposed spoils disposal areas. South of Crystal Springs Road, the closest residences are on Laurel Hill Court as close as 1,000 feet to the spoils disposal areas adjacent to the access road.

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[3] Every GHG has a global warming potential (GWP), a measurement of the impact that the particular gas has on "radiative forcing" (i.e., the additional heat/energy that is retained in the earth's ecosystem through the addition of this gas to the atmosphere). Carbon dioxide equivalents provide a universal standard of measurement against which the effects of releasing (or avoiding the release of) different GHGs can be evaluated. Methane has a GWP of 21 and nitrous oxide has a GWP of 310, meaning that their effect on global warming would be 21 and 310 times, respectively, greater than an equivalent amount of carbon dioxide.

The nearest schools, Odyssey Middle School and Highlands Elementary School, are each approximately 0.6 miles east of the eastern construction limits (one to the northeast and one to the southeast). The nearest hospital is the Mills-Peninsula Medical Center, which is 4.5 miles to the northeast on El Camino Real in Burlingame. The nearest nursing home, the Brookside Skilled Nursing Hospital, is located approximately 3 miles to the east of the construction area in San Mateo.

5.8.2 Regulatory Framework

The Clean Air Act Amendments of 1970 established national ambient air quality standards (NAAQS), and individual states retained the option to adopt more stringent standards and to include other pollution sources. California had already established its own air quality standards when federal standards were established, and, because of the unique meteorological conditions in California, there is considerable difference between the state and national ambient air quality standards, as shown in **Table 5.8-2.** California ambient air quality standards (CAAQS) tend to be at least as protective as national ambient standards and are often more stringent.

The ambient air quality standards are intended to protect the public health and welfare, and they specify the concentration of pollutants (with an adequate margin of safety) to which the public can be exposed without adverse health effects. Air quality standards are designed to protect those segments of the public most susceptible to respiratory distress, known as sensitive receptors, including asthmatics, the very young, the elderly, people weak from other illness or disease, and persons engaged in strenuous work or exercise. Healthy adults can tolerate occasional exposure to air pollution levels that are somewhat above the ambient air quality standards before adverse health effects are observed.

5.8.2.1 Criteria Pollutants

Federal Regulations

Federal Clean Air Act

The 1977 Clean Air Act (last amended in 1990, 42 United States Code [USC] 7401 et seq.) required that regional planning and air pollution control agencies prepare regional air quality plans outlining the measures by which both stationary and mobile pollutant sources will be controlled to achieve all standards by the deadlines specified in the Clean Air Act. For the SFBAAB, the Association of Bay Area Governments (ABAG), the Metropolitan Transportation Commission (MTC), and the BAAQMD jointly prepared the *Bay Area Air Quality Plan* in 1982, which predicted

TABLE 5.8-2
STATE AND FEDERAL AMBIENT AIR QUALITY STANDARDS AND ATTAINMENT STATUS

		(State) SAAQS[a]		(Federal) NAAQS[b]	
Pollutant	**Averaging Time**	**Standard**	**Attainment Status**	**Standard**	**Attainment Status**
Ozone (O_3)	1-hour	0.09 ppm	**N**	NA	See note (c)
	8-hour	0.07 ppm	**N**	0.075 ppm	**N**[d]
Carbon Monoxide (CO)	1 hour	20 ppm	A	35 ppm	A
	8 hour	9.0 ppm	A	9 ppm	A
Nitrogen Dioxide (NO_2)	1 hour	0.18 ppm	A	NA	NA
	Annual	0.030 ppm	A	0.053 ppm	A
Sulfur Dioxide (SO_2)	1 hour	0.25 ppm	A	NA	NA
	24 hour	0.04 ppm	A	0.14 ppm	A
	Annual	NA	NA	0.03 ppm	A
Particulate Matter (PM_{10})	24 hour	50 μg/m³	**N**	150 μg/m³	U
	Annual[e]	20 μg/m³	**N**	NA	NA
Fine Particulate Matter ($PM_{2.5}$)	24 hour	NA	NA	35 μg/m³	**N**[f]
	Annual	12 μg/m³	**N**	15 μg/m³	A
Sulfates	24 hour	25 μg/m³	A	NA	NA
Lead	30 day	1.5 μg/m³	A	NA	NA
	Quarter	NA	NA	1.5 μg/m³	A
Hydrogen Sulfide	1 hour	0.03 ppm	U	NA	NA
Visibility-Reducing Particles	8 hour	See note (g)	U	NA	NA

NOTES: A = Attainment; N = Nonattainment; U = Unclassified; NA = not applicable or no applicable standard; ppm = parts per million; μg/m³ = micrograms per cubic meter.

[a] SAAQS = state ambient air quality standards (California). SAAQS for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1-hour and 24-hour), nitrogen dioxide, particulate matter, and visibility-reducing particles are values that are not to be exceeded. All other state standards shown are values not to be equaled or exceeded.

[b] NAAQS = national ambient air quality standards. NAAQS, other than ozone and particulates, and those based on annual averages or annual arithmetic means, are not to be exceeded more than once a year. The 1-hour ozone standard is attained if, during the most recent three-year period, the average number of days per year with maximum hourly concentrations above the standard is equal to or less than one. The 8-hour ozone standard is attained when the three-year average of the fourth highest daily concentration is 0.08 ppm or less. The 24-hour PM10 standard is attained when the three-year average of the 99th percentile of monitored concentrations is less than the standard. The 24-hour PM2.5 standard is attained when the three-year average of 98th percentile is less than the standard.

[c] The national 1-hour ozone standard was revoked by the U.S. EPA on June 15, 2005.

[d] In 2008, the U.S. EPA lowered the 8-hour federal standard for ozone to 0.075 ppm. The EPA will issue final designations based on this standard, at which point it is expected that the Bay Area Air Basin will be designated as nonattainment.

[e] State standard = annual geometric mean; national standard = annual arithmetic mean.

[f] Effective in April 2009.

[g] Statewide visibility-reducing particle standard (except Lake Tahoe Air Basin): Particles in sufficient amount to produce an extinction coefficient of 0.23 per kilometer when the relative humidity is less than 70 percent. This standard is intended to limit the frequency and severity of visibility impairment due to regional haze and is equivalent to a 10-mile nominal visual range.

SOURCE: BAAQMD, 2010.

attainment of the federal clean air standards within the basin by 1987. This forecast was somewhat optimistic; the entire basin did not meet federal clean air standards until 1991. The plan, which is referred to as the State Implementation Plan (SIP), must contain control strategies that demonstrate attainment of national ambient air quality standards by deadlines established in the federal Clean Air Act.

The SFBAAB's current attainment status with respect to federal standards is summarized in Table 5.8-2. In general, the Bay Area experiences low concentrations of most pollutants when compared to the federal standards, except for ozone and particulate matter (PM_{10} and $PM_{2.5}$), for which standards are exceeded periodically. The Bay Area's attainment status for ozone has changed several times during the past decade, first from "nonattainment" to "attainment" in 1995, then back to "unclassified nonattainment" in 1998 for the 1-hour federal ozone standard. In June 2004, the Bay Area was designated as "marginal nonattainment" for the 8-hour ozone standard. In 2008, the U.S. Environmental Protection Agency (U.S. EPA) lowered the 8-hour ozone standard from 0.08 parts per million (ppm) to 0.075 ppm. Given the revised standard, it is expected that the SFBAAB's attainment status may be downgraded to remove the "marginal" designation when the U.S. EPA issues its final designations in 2010. In 1998, after many years without violations of any CO standards, the SFBAAB's attainment status for CO was upgraded to "attainment."

In response to the U.S. EPA's redesignation of SFBAAB as nonattainment for the 1-hour federal ozone standard, the BAAQMD, ABAG, and MTC were required to develop an ozone attainment plan to meet this standard. The *1999 Ozone Attainment Plan* (OAP) was prepared and adopted by these agencies in June 1999. In March 2001, the U.S. EPA proposed and took final action to approve some portions but disapprove other portions of the 1999 OAP while also making the finding that the Bay Area had not attained the national 1-hour ozone standard. As a result, a revised OAP was prepared and adopted in October 2001. The 2001 plan amended and supplemented the 1999 plan and provided for attainment of the federal 1-hour ozone standard by 2006, the attainment deadline. However, in June 2005, the U.S. EPA revoked the federal 1-hour ozone standard.

The 2001 OAP contains control strategies for stationary and mobile sources. The adopted mobile-source control program was estimated to significantly reduce volatile organic compound (VOC) and NO_x emissions between 2000 and 2006, lowering emissions from on- and off-road diesel engines (including construction equipment). In addition to emission reduction requirements for engines and fuels, the OAP identified 28 transportation control measures to reduce automobile emissions, including improved transit service and transit coordination, new carpool lanes, signal timing, freeway incident management, and increased state gas tax and bridge tolls.

State Regulations

California Clean Air Act

In 1988, California passed the California Clean Air Act (California Health and Safety Code Section 39600 et seq.), which, like its federal counterpart, called for the designation of areas as attainment or nonattainment but based on the state ambient air quality standards rather than the federal standards. The SFBAAB attainment status with respect to state standards is summarized in Table 5.8-2. As shown in the table, the Bay Area experiences low concentrations of most pollutants when compared to state standards, except for ozone, PM_{10}, and $PM_{2.5}$, for which standards are exceeded periodically. All current basinwide air quality plans address required progress toward meeting state standards.

California Air Resources Board

The CARB is the state agency responsible for regulating air quality. The CARB's responsibilities include establishing state ambient air quality standards, emissions standards, and regulations for mobile emissions sources (e.g., autos, trucks, etc.), in addition to overseeing the efforts of countywide and multi-county air pollution control districts, which have primary responsibility over stationary sources. The CARB also regulates vehicle fuels with the intent to reduce emissions; it has set emission reduction performance requirements for gasoline (California reformulated gasoline) and limited the sulfur and aromatic hydrocarbons content of diesel fuel to make it burn cleaner. The CARB also sets the standards used to pass or fail vehicles in smog-check and heavy-duty truck inspection programs.

Diesel Idling Limits. In 2000, the CARB approved a comprehensive *Diesel Risk Reduction Plan* to reduce diesel emissions from both new and existing diesel-fueled engines. The plan focuses on reducing emissions from diesel-fueled engines (through new standards and retrofitting) and reducing the sulfur content of diesel fuel to enable the use of advanced diesel particulate matter (DPM) emission controls. The plan's goals are to achieve a 75 percent reduction in DPM by 2010 and an 85 percent reduction by 2020 (from the 2000 baseline).

The CARB approved a regulatory measure to reduce emissions of toxic and criteria pollutants by limiting the idling of new heavy-duty diesel vehicles, which altered five sections of Title 13 of the California Code of Regulations. The changes relevant to project construction are in Section 2485, Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling, and they include the following:

> *(c) The driver of any vehicle subject to this section:*
>
> *(1) shall not idle the vehicle's primary diesel engine for greater than five minutes at any location, except as noted below; and*
>
> *(2) shall not operate a diesel-fueled auxiliary power system (APS) to power a heater, air conditioner, or any ancillary equipment on that vehicle during sleeping or resting in a sleeper berth for greater than five minutes at any location when within 100 feet of a restricted area, except as noted below.*

"Restricted area" means any real property zoned for individual or multifamily housing units that has one or more such units. There are 12 exceptions to this requirement (e.g., emergency situations, military uses, adverse weather conditions, etc.), including: when a vehicle's power takeoff is being used to run pumps, blowers, or other equipment; when a vehicle is stuck in traffic, stopped at a light, or under direction of a police officer; when a vehicle is queuing beyond 100 feet from any restricted area; or when an engine is being tested, serviced, or repaired.

Local Regulations

Bay Area Air Quality Management District

The BAAQMD is the regional agency responsible for air quality regulation within the SFBAAB. The BAAQMD regulates air quality through its planning and review activities; has permit authority over most types of stationary emission sources and can require stationary sources to obtain permits; and can impose emission limits, set fuel or material specifications, or establish operational limits to reduce air emissions. The BAAQMD regulates new or expanding stationary sources of toxic air contaminants.

In September 2005, the BAAQMD, in cooperation with the MTC and ABAG, prepared the *Bay Area 2005 Ozone Strategy*. The *Ozone Strategy* is a roadmap showing how the San Francisco Bay Area will achieve compliance with the state 1-hour ozone standard as expeditiously as practicable and how the region will reduce the transport of ozone and ozone precursors to neighboring air basins. The *2005 Ozone Strategy* describes how the Bay Area will fulfill California Clean Air Act planning requirements for the state 1-hour ozone standard through the proposed control strategy. The control strategy includes stationary-source control measures to be implemented through BAAQMD regulations; mobile-source control measures to be implemented through incentive programs and other activities; and transportation control measures to be implemented through transportation programs in cooperation with the MTC, local governments, transit agencies, and others.

An update of the *2005 Ozone Strategy* is currently in progress. The objectives of the *2009 Clean Air Plan* (CAP) are to:

- Comply with California Clean Air Act requirements
- Develop an integrated plan that addresses multiple pollutants
- Adopt control strategies to minimize public health risk
- Achieve state standards as soon as practical
- Update previously adopted control strategies
- Reduce ozone transport to downwind air basins
- Report on progress and update baseline and trends

It is expected that the 2009 CAP and associated California Environmental Quality Act (CEQA) documents will be adopted in 2010.

The BAAQMD is currently in the process of adopting new CEQA Air Quality Guidelines, which include quantitative CEQA significance thresholds for construction-related emissions of criteria pollutants, precursors, toxic air contaminants (TACs), and GHGs (BAAQMD, 2009). The BAAQMD has not yet adopted these guidelines or quantitative significance thresholds for construction-related emissions, although the BAAQMD expects to adopt these new guidelines in 2010.

5.8.2.2 Climate Change and GHG Emissions

Federal Regulations

With respect to GHGs, the U.S. Supreme Court ruled on April 2, 2007 that CO_2 is an air pollutant as defined under the Clean Air Act, and that the U.S. EPA has the authority to regulate GHG emissions. No federal regulations or policies regarding GHG emissions have been adopted that would be applicable to the proposed project. In late 2009, EPA finalized an "endangerment finding" and a "cause and contribute finding" that state that anthropogenic GHGs contribute to global warming and that such warming endangers the public health of existing and future generations.[4] These findings are expected to support adoption of federal GHG emission rules for light duty vehicles. Adoption of such rules would not directly affect the proposed project, and are not expected to become effective until project construction activities have been completed.

State Regulations

Executive Order S-3-05 (2005)

In 2005, in recognition of California's vulnerability to the effects of climate change, Governor Schwarzenegger announced the following GHG emission reduction targets, as established through Executive Order S-3-05: by 2010, reduce GHG emissions to 2000 levels; by 2020, reduce GHG emissions to 1990 levels; and by 2050, reduce GHG emissions to 80 percent below 1990 levels.

Assembly Bill 32 (2006)

In 2006, California passed the California Global Warming Solutions Act of 2006 (Assembly Bill No. 32 or AB 32; California Health and Safety Code Division 25.5, Section 38500, et seq.). It requires the CARB to design and implement emission limits, regulations, and other measures to reduce statewide GHG emissions to 1990 levels by 2020 (representing a 25 percent reduction in emissions). The reduction would be accomplished through an enforceable statewide cap on global warming emissions and reduction measures that would be phased in starting by 2012, and through discrete early action measures that could be adopted as regulations and made effective by 2010. Construction of the LCSDI project is proposed for 2011, so measures could become effective during implementation of the proposed project that would pertain to construction-related equipment operations. Some proposed early action measures will require new legislation to implement, some will require subsidies, some have already been developed, and some will require additional effort to evaluate and quantify. AB 32 primarily establishes a time frame for the CARB to adopt emissions limits, rules, and regulations, but the act does not provide thresholds or methodologies for analyzing a project's impacts on global climate change.

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[4] These two findings for greenhouse gases under Section 202(a) of the Clean Air Act were signed by the EPA Administrator on December 7, 2009 (http://www.epa.gov/climatechange/endangerment.html).

CARB Scoping Plan (2008)

Pursuant to AB 32, the CARB adopted the Scoping Plan in December 2008, which is the State's plan to achieve GHG reductions in California required by AB 32. The Scoping Plan contains the main strategies California will implement to achieve reduction of 169 MMT of CO_2E, or approximately 30 percent from the state's projected 2020 emission level of 596 MMT of CO_2E under a business-as-usual scenario, and a reduction of 42 MMT CO_2E, or almost 10 percent, from 2002–2004 average emissions.

The Scoping Plan also includes CARB-recommended GHG reductions for each emissions sector of the state's GHG inventory. The largest proposed GHG reductions are expected to be achieved from improving emission standards for light-duty vehicles (estimated reductions of 31.7 MMT CO_2E), implementation of the Low Carbon Fuel Standard (15.0 MMT CO_2E), energy efficiency measures in buildings and appliances and the widespread development of combined heat and power systems (26.3 MMT CO_2E), and a renewable portfolio standard for electricity production (21.3 MMT CO_2E). CARB has not yet determined what amount of GHG reductions from local government operations will be recommended; however, the Scoping Plan does state that land use planning and urban growth decisions will play an important role in the state's GHG reductions because local governments have primary authority to plan, zone, approve, and permit how land is developed to accommodate population growth and the changing needs of their jurisdictions. The CARB is also developing an additional protocol for community emissions. CARB further acknowledges that decisions on how land is used will have large impacts on the GHG emissions that will result from the transportation, housing, industry, forestry, water, agriculture, electricity, and natural gas emission sectors. The Scoping Plan states that the ultimate GHG reduction assignment to local government operations is to be determined (CARB, 2008). With regard to land use planning, the Scoping Plan expects approximately 5.0 MMT CO_2E will be achieved associated with implementation of SB 375, which is discussed further below.

Other Bills and Executive Orders

There are several other senate bills and executive orders that have been passed over the past several years, and they relate to: reducing GHG emissions from electricity generation (Senate Bills 1078, 107, and 1368, Executive Order S-14-08); establishing guidelines for mitigating GHG emissions or the effects of GHG emissions under CEQA by 2010 (Senate Bill 97); aligning regional transportation planning efforts, regional GHG reduction targets, and land use and housing allocation through adoption of a Sustainable Communities Strategy (SCS) or Alternative Planning Strategy (APS) (Senate Bill 375); establishing targets for reducing GHG emissions to the 2000 level by 2010 and to the 1990 level by 2020, and to 80 percent below the 1990 level by 2050 (Executive Order S-3-05); providing land use planning guidance related to sea level rise and other climate change impacts (Executive Order S-13-08); and establishing a Low-Carbon Fuel Standard (LCFS) and coordinating actions of the CEC, the CARB, the University of California, and other agencies to develop and propose protocols for measuring the life-cycle carbon intensity of transportation fuels.

Local Regulations

Bay Area Air Quality Management District Climate Protection Program

The BAAQMD established a climate protection program to reduce pollutants that contribute to global climate change and affect air quality in the Bay Area Air Basin. The climate protection program includes measures that promote energy efficiency, reduce vehicle miles traveled, and develop alternative sources of energy—all of which assist in reducing emissions of GHG and in reducing air pollutants that affect the health of residents. BAAQMD also seeks to support current climate protection programs in the region and to stimulate additional efforts through public education and outreach, technical assistance to local governments and other interested parties, and promotion of collaborative efforts among stakeholders.

City and County of San Francisco

In February 2002, the City and County of San Francisco (CCSF) Board of Supervisors passed the *Greenhouse Gas Emissions Reduction Resolution* (Number 158-02) committing the CCSF to a GHG emissions reduction goal of 20 percent below 1990 levels by the year 2012. The resolution also directed the San Francisco Department of the Environment (SFDE), the SFPUC, and other appropriate CCSF agencies to complete and coordinate analysis and preparations for a local action plan targeting GHG emissions reduction activities.

In September 2004, the SFDE and the SFPUC published the *Climate Action Plan for San Francisco: Local Actions to Reduce Greenhouse Gas Emissions* (SFDE, 2004). The plan describes recommended emissions reduction actions in the key target sectors—transportation, energy efficiency, renewable energy, and solid waste management—to meet stated goals by 2012. The plan presents proposals to reduce annual CO_2 emissions by 2.5 million tons by 2012, a 20 percent reduction below 1990 emissions, such as greening vehicle fleets; increasing energy efficiency in public and private buildings; developing renewable energy technologies like solar, wind, fuel cells, and tidal power; and expanding residential and commercial recycling programs. The roadmap to achieving these goals requires the cooperation of a number of city, regional, and state agencies as well as private-sector partners. Although the Board of Supervisors has not formally committed the CCSF to perform the actions addressed in the plan, and many of the actions require further development and commitment of resources, the plan is a blueprint for GHG emission reductions, and several actions are now in progress.

In May 2008, San Francisco adopted an ordinance amending its Environment Code to establish GHG emission targets and action plans, to authorize the SFDE to coordinate efforts to meet these targets, and to make environmental findings. The ordinance establishes the following GHG reduction limits for San Francisco and the target dates to achieve them:

- Determine 1990 city GHG emissions by 2008, the baseline level with reference to which target reductions are set

- Reduce GHG emissions by 25 percent below 1990 levels by 2017
- Reduce GHG emissions by 40 percent below 1990 levels by 2025
- Reduce GHG emissions by 80 percent below 1990 levels by 2050

The ordinance also requires city departments to prepare Climate Action Plans that assess and report GHG emissions and make recommendations to reduce emissions. As part of this mandate, the San Francisco Planning Department is required to: (1) update and amend the city's applicable General Plan elements to include the emissions reduction limits set forth in the ordinance and policies to achieve those targets; (2) consider a project's impact on the city's GHG reduction limits specified in the ordinance as part of its review under CEQA; and (3) work with other city departments to enhance the "transit first" policy to encourage a shift to sustainable modes of transportation, thereby reducing emissions and helping to achieve the targets set forth by the ordinance.

The CCSF has already implemented actions related to the reduction of GHG emissions from initiatives related to transportation, solar power development, and energy efficiency. With regard to transportation, in 1999 the Board adopted the Healthy Air and Smog Prevention Act, which became Chapter 4 of San Francisco's Environment Code. This ordinance requires that all new purchases or leases of passenger vehicles and light-duty trucks must either be rated as ultra-low-emission or zero-emission vehicles (ZEVs) (at least 10 percent were to be ZEVs by July 1, 2000). Requirements were also set forth for medium- and heavy-duty vehicles and motorized equipment, and for phasing out all highly polluting vehicles and equipment (SFDE and SFPUC, 2004). The CCSF has also contributed grant funds toward the development of three alternate fueling facilities. It continues to seek funds to expand alternate fueling infrastructure and has been successful in developing a number of electric-vehicle charging stations in San Francisco and throughout the Bay Area. In addition, the CCSF encourages car sharing within San Francisco and limits the amount of parking allowed in new downtown residential developments (Planning Code Section 151.1). The CCSF also funds municipal solar and energy efficiency programs through a combination of the SFPUC's Hetch Hetchy Power Enterprise revenues, state grants, and loans, and the CCSF's General Fund, at approximately $5.5 million annually.

San Francisco Public Utilities Commission

The SFPUC is also developing energy-efficiency and renewable generation projects. To date, several renewable generation projects have been constructed, and many more are in the planning, design, or construction phases. For instance, in 2002, the SFPUC installed a small reciprocating engine to use biogas recovered from the Oceanside Water Pollution Control Plant. In 2003, a 2 megawatt biogas plant began operation at the Southeast Water Pollution Control Plant. Both of these plants use sewage-produced CH_4 that would otherwise be flared-off. In addition, the SFPUC has completed several solar electric projects for City facilities. The first project, a 675-kilowatt solar electric photovoltaic (PV) system, is located on the Moscone Convention Center's roof. This project generates 826,000 kilowatt-hours of electricity per year and provides a solar showplace for visitors.

Additional solar PV projects in operation include a 255-kilowatt project at the Southeast Water Pollution Control Plant and a 245-kilowatt project at Pier 96, the Norcal recycling facility. Five other solar PV projects are currently under construction. The SFPUC has also installed pyranometers at 19 sites on City buildings and schools to collect data about the availability of sunlight, as well as instruments to measure wind speed and ambient temperature. The variability in solar incidence is based on microclimate and geography, and when used in conjunction with availability of appropriate space suggests potential future solar PV project sites.

The SFPUC also manages and implements energy-efficiency projects in municipal buildings and facilities and provides energy-efficiency services such as energy audits and design and construction management. Energy retrofit technologies include energy-efficient lighting, HVAC, motors, controls, and energy management systems.

Municipal energy-efficiency and renewable generation projects are funded by Hetch Hetchy power sales net revenue as well as state grants and loans, among other funding mechanisms. Funds that the SFPUC designates for energy projects are appropriated in a project account called the Mayor's Energy Conservation Account (MECA). MECA is a financing mechanism allowing the SFPUC to make a loan to a city department to fund an energy project. For energy-efficiency projects, loans can be paid back though the department's energy savings. As of 2007, the SFPUC had invested $24 million in energy-efficiency projects and estimates that this reduced peak demand by approximately 3,800 kilowatts and CO_2 emissions by approximately 11,000 tons per year. Municipal solar PV projects have been funded by SFPUC Power Enterprise such that client departments pay the same rate for solar power as they would normally pay for that power from the City's Hetch Hetchy hydroelectric generation. To date, 2 megawatts of municipal solar plants have been installed or are under construction for an investment (before rebates) of about $20 million.

Municipal energy-efficiency projects recently completed or underway include: lighting retrofits at Moscone Convention Center (North and South), San Francisco General Hospital, mental health clinics, city parking garages, Golden Gate Park, and West Portal Library; Department of Parking and Traffic light-emitting diode (LED) traffic signal conversions; efficient refrigerators at Housing Authority facilities; motor replacements at the Southeast Water Pollution Control Plant; and efficient lighting, HVAC, building shell, and energy management control upgrades at the new Moscone West Convention Center. As part of the Department Climate Action Plans under the 2008 Greenhouse Gas Reduction Ordinance, each department is to identify whether its buildings are suitable for solar installation and to develop a funding plan for such capital improvements.

The SFPUC is also looking at several Bay Area sites for wind power development and has installed wind monitoring equipment at five sites in and around the City. Additional data are being collected for City property in the Sierra foothills.

5.8.3 Impacts and Mitigation Measures

5.8.3.1 Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to air quality but generally considers that implementation of the proposed project would have a significant air quality impact if it were to:

- Conflict with or obstruct implementation of the applicable air quality plan;
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors);
- Expose sensitive receptors to substantial pollutant concentrations;
- Create objectionable odors affecting a substantial number of people;
- Conflict with the state goal of reducing GHG emissions in California to 1990 levels by 2020, as set forth by the timetable established in AB 32 (California Global Warming Solutions Act of 2006), such that the project's GHG emissions would result in a substantial contribution to global climate change;
- Conflict with San Francisco's *Climate Action Plan* such that it would impede implementation of the local GHG reduction goals established by the 2008 *Greenhouse Gas Reduction Ordinance*;
- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment; or
- Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.

5.8.3.2 Approach to Analysis

The air quality impact analysis considers construction and operational impacts associated with the LCSDI project. Construction-related impacts would occur primarily within a 9-month period when substantial completion of project-related construction activities would occur, while operational impacts would occur over many years after construction has been completed. Construction air emissions are evaluated in accordance with the adopted BAAQMD guidelines for assessing and mitigating air quality impacts (BAAQMD, 1999), but this analysis also includes an evaluation of the project's construction-related emissions based on the proposed BAAQMD CEQA Air Quality Guidelines (BAAQMD, 2009). Similarly, operational impacts on air quality are evaluated in accordance with both the adopted and proposed BAAQMD guidelines. The approach to analysis of the various categories of air pollutants is described below.

The BAAQMD's proposed guidelines, however, have not been adopted and are subject to ongoing review and comment. Consequently, the proposed guidelines may not be adopted in their current form. Nevertheless, in anticipation of the potential for new guidelines, this EIR analyzes potential air quality impacts under both current and proposed guidelines. Until and unless new guidelines are adopted, the current CEQA guidelines provide the basis for significance determinations in this EIR. To be conservative, however, the EIR describes potentially significant impacts and corresponding mitigation measures to be implemented if the BAAQMD adopts the proposed guidelines or other substantially similar regulations.

Criteria Pollutants

Under adopted guidelines, the BAAQMD does not require quantification of construction-related fugitive dust emissions, but provides guidance for quantification and considers the significance of a project's impact based on the extent of control measures that are proposed to be implemented. For example, if appropriate mitigation measures are implemented for each project to control fugitive dust emissions, the BAAQMD considers potentially significant project-related and potentially significant contributions to cumulative impacts to be less than significant.

The adopted guidelines similarly consider temporary construction equipment exhaust emissions to have been included in the regional emissions "budget" for on- and off-road sources. By virtue of this inclusion, the CEQA Guidelines consider these emissions to not be "new" to the air basin. Therefore, the construction-related emissions from the project would not prevent attainment or maintenance of the CO and ozone standards within the Bay Area. If measures are implemented to maintain construction equipment in good working order, the BAAQMD considers potentially significant project-related and potentially significant contributions to cumulative regional exhaust emissions impacts to be less than significant.

As indicated above (under Section 5.8.2, Regulatory Framework), the BAAQMD has not adopted quantitative thresholds of significance for construction-related emissions at this time. However, in 2009, the BAAQMD began the process of preparing new CEQA Air Quality Guidelines as well as quantitative CEQA significance thresholds for construction-related emissions of criteria pollutants (BAAQMD, 2009). The BAAQMD expects to adopt these (or similar) new guidelines and thresholds of significance in 2010. Therefore, in anticipation of the BAAQMD's expected adoption of new guidelines and quantitative significance thresholds for construction-related emissions, this EIR also includes a quantitative analysis of the project's construction-related emissions based on the proposed BAAQMD CEQA Air Quality Guidelines (which include qualitative and quantitative significance thresholds) using worst-case assumptions for the project's construction emissions. The proposed guidelines would not change the BAAQMD's current guidelines for fugitive dust. However, under the proposed BAAQMD thresholds of significance for criteria pollutants, the proposed project would result in a significant impact if construction-related emissions were to exceed the following thresholds: more than 54 pounds per day of ROG or NO_x, 54 pounds per day of $PM_{2.5}$ (exhaust emissions only), or 82 pounds per day of PM_{10} (exhaust emissions only).

The adopted and proposed BAAQMD guidelines also provide significance thresholds for criteria pollutant emissions associated with project operation. However, operation of the water storage facilities associated with the LCSDI project would not directly generate criteria air pollutants, and indirect criteria pollutant emissions associated with operation of project facilities would not change with the LCSDI project. Therefore, air pollutant emissions associated with project operation are discussed qualitatively.

Toxic Air Contaminants

The proposed guidelines do not change the BAAQMD's current threshold for TACs. The BAAQMD TACs threshold is an increased cancer risk of more than 10 in 1 million for a person with maximum exposure potential and increased non-cancer risk of 1.0 Hazard Index (chronic or acute). However, the proposed guidelines also apply these thresholds to construction emissions, whereas these thresholds under the current guidelines apply only to operational emissions. In addition, proposed guidelines would add the following additional criterion to both construction-related and operational emissions: increase in annual average ambient $PM_{2.5}$ of more than 0.3 $\mu g/m^3$. The proposed guidelines would also change the analysis of cumulative TAC emissions, as further described below under Section 5.8.3.7, Cumulative Impacts.

Greenhouse Gases

On December 30, 2009, the State of California Natural Resources Agency adopted amendments to the CEQA guidelines that address GHG emissions and become effective in March 2010. The adopted amendments provide a basic framework for assessing GHG impacts, but do not establish numerical significance thresholds for GHG emissions. Adopted guidelines add the following criteria: (1) generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment; or (2) conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs. These two criteria are included under the significance criteria in Section 5.8.3.1, above, and impacts of the proposed project with respect to these criteria are evaluated under Impacts AQ-4 and AQ-6 below.

For GHG emissions during project construction and operation, no state or regional air quality agency has adopted a methodology or quantitative threshold (analogous to those for criteria pollutants) that can be applied to a specific development or construction project to evaluate the significance of its contribution to these emissions. At this time, the proposed BAAQMD thresholds of significance include a GHG threshold for operational emissions but none for construction (BAAQMD, 2009).

The proposed BAAQMD guidelines recommend a case-by-case consideration of construction GHG emissions and encourage project applicants to implement construction GHG reduction strategies where feasible. The BAAQMD has also indicated that it plans to develop a list of best management practices, such as alternative fuels, use of local materials, and recycling of construction and demolition waste, to provide lead agencies with strategies that reduce greenhouse gas emissions from construction (BAAQMD, 2009). The impact analysis in this section calculates the quantity of GHGs that would be emitted during project construction and operation, and then compares construction emissions to total GHG emissions in the Bay Area and in California; operational emissions are compared to proposed BAAQMD significance thresholds as appropriate. It also addresses steps that the State intends to take to reduce GHG emissions and the actions that the SFPUC is actively taking to reduce GHG emissions so that implementation of the Water System Improvement Program (WSIP) and its component facility improvement projects would not conflict with the state's goals of reducing GHG emissions to 1990 levels by 2020.

5.8.3.3 Impact Summary

Table 5.8-3 provides a summary of potential impacts on air quality. For each impact, two significance determinations are provided, the first one based on the existing BAAQMD CEQA guidelines and the second based on the proposed guidelines.

TABLE 5.8-3
SUMMARY OF IMPACTS – AIR QUALITY

Impact	Significance Determination*	
	LCSD Site	Sampling Station Site
Impact AQ-1: Construction emissions of criteria pollutants.	PSM/SU	
Impact AQ-2: Generation of diesel particulate matter (DPM) and toxic air contaminants (TACs) during construction.	LS/LS	LS/LS
Impact AQ-3: Odors generated during project construction.	LS/LS	LS/LS
Impact AQ-4: GHG construction emissions and conflicts with any applicable plans, policies, or regulations adopted for the purpose of reducing GHG emissions.	LS/LS	LS/LS
Impact AQ-5: Air pollutant and odor during project operation.	LS/LS	LS/LS
Impact AQ-6: GHG operational emissions and conflicts with any applicable plans, policies, or regulations adopted for the purpose of reducing GHG emissions.	LS/LS	N/A
Impact C-AQ: Cumulative emissions of criteria pollutants, toxic air contaminants, and greenhouse gas emissions.	LS/SU	

B = Beneficial impact
N/A = Not Applicable or no impact
LS = Less than Significant impact, no mitigation required
SM = Significant impact, can be Mitigated to less than significant
PSM = Potentially Significant impact, can be Mitigated to less than significant
SU = Significant Unavoidable impact
PSU = Potentially Significant Unavoidable impact
* Significance Determination under adopted 1999 BAAQMD CEQA Guidelines / Significance Determination under proposed 2009 BAAQMD CEQA Guidelines

5.8.3.4 Construction Impacts

Impact AQ-1: Construction emissions of criteria pollutants.

Project construction would generate fugitive dust[5] (including PM_{10} and $PM_{2.5}$) and other criteria pollutants, primarily as a result of a variety of construction activities, including excavation, grading, demolition, vehicle travel on paved and unpaved surfaces, and vehicle exhaust. This impact would be short term, spanning the 9-month duration of major project construction activities at the LCSD site and the 4-month duration at the sampling station site.

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[5] "Fugitive" emissions generally refer to those emissions that are released to the atmosphere by some means other than through a stack or tailpipe.

Dust Emissions

Evaluation with Adopted BAAQMD Guidelines. Under the BAAQMD's adopted CEQA Guidelines (1999), the BAAQMD does not require quantification of construction-related fugitive dust emissions but considers dust emissions to be *potentially significant* but mitigated to a less-than-significant level with implementation of applicable BAAQMD-recommended dust control measures presented in Mitigation Measure M-AQ-1a (Dust Control Measures).

Evaluation with Proposed BAAQMD Guidelines. Under the proposed BAAQMD CEQA Guidelines, there are no quantitative thresholds for fugitive dust. However, the BAAQMD recommends that all construction-related emissions be quantified using the URBEMIS model, and the model output estimates all criteria pollutant emissions including fugitive dust (see **Table 5.8-4**). Similar to the adopted guidelines, dust emissions would be *potentially significant* but mitigated to a less-than-significant level under the proposed guidelines with implementation of the control measures to reduce fugitive dust presented in Mitigation Measure M-AQ-1a (Dust Control Measures).

Under both adopted and proposed guidelines, the BAAQMD considers construction-related fugitive dust emissions to be mitigated to a less-than-significant level if BAAQMD-recommended dust controls are implemented. These controls are included in Mitigation Measure M-AQ-1a. Therefore, the project's fugitive dust emissions impact would be reduced to a less-than-significant level under both adopted and proposed BAAQMD significance thresholds with implementation of Mitigation Measure M-AQ-1a.

Equipment Exhaust Emissions

Evaluation with Adopted BAAQMD Guidelines. Operation of construction equipment and vehicles (i.e., heavy equipment and delivery/haul trucks, worker commute vehicles, air compressors, and generators) would generate criteria pollutants (CO and ozone precursors). Volatile organic compounds (VOCs) and NO_x from these emission sources, both ozone precursors, would incrementally add to regional increases in ozone during project construction. The adopted BAAQMD CEQA Guidelines recognize that construction equipment emits ozone precursors but indicate that such emissions are included in the emissions inventory that is the basis for regional air quality plans, and that construction emissions are not expected to impede the attainment or maintenance of ozone standards in the Bay Area (BAAQMD, 1999). Therefore, under the BAAQMD's adopted CEQA Guidelines (1999), the project's equipment exhaust emissions are considered *potentially significant,* but mitigated to a less-than-significant level with implementation of the BAAQMD-recommended exhaust control measures presented in Mitigation Measure M-AQ-1b (Exhaust Control Measures).

TABLE 5.8-4
AIR POLLUTANT EMISSIONS FROM CONSTRUCTION ACTIVITIES AT THE LCSD VICINITY AND COMPARISON TO PROPOSED BAAQMD SIGNIFICANCE THRESHOLDS (pounds per day)

Project Construction Stage	# of Days	ROG	NO_x	CO	SO_2	PM_{10}[a]	$PM_{2.5}$[a]	CO_2
Without Mitigation								
Stilling Basin – Excavation Soil Nail Shoring	54	804.6	7932.6	3326.4	0	464.4	329.4	1,018,375.2
Stilling Basin – Rock Anchors	24	213.6	2244	876	0	146.4	91.2	295,564.8
Stilling Basin – Concrete Placement, Slab and Walls	76	638.4	7045.2	2629.6	0	471.2	288.8	861,954.0
Toe of Dam – Lower Trailing Walls, Chute Blocks	22	184.8	2039.4	761.2	0	136.4	83.6	249,513.0
Top of Dam – Demolish Parapet Wall	40	112	800	524	0	156	72	81,852.0
Top of Dam – Core Drill/Place/Grout Anchors in Parapet, Ogee, and Bridge	55	522.5	5522	2057	0	346.5	220	708,851.0
Top of Dam – Concrete in Parapet Walls and Bridge Piers	37	44.4	321.09	185	0	114.7	40.7	36,604.0
Top of Dam – Forms and Concrete Placement for Ogee Weir	43	86	718.1	378.4	0	150.5	60.2	82,151.5
Stilling Basin Metal Railings and Riprap	15	67.5	723	286.5	0	66	34.5	86,031.0
Sampling Station #5 – Fine Grading	40	2.0	15.4	9.0	0.0	3.4	1.3	1,449.9
Sampling Station #5 – Construction	40	3.0	16.5	13.0	0.0	1.2	1.1	1,884.8
Total Pounds		2,678.8	27,377.3	11,046.1	0	2056.7	1222.8	3,424,231.2
Average Pounds Per Day (168 days)		15.9	**163.0**	65.8	0.0	12.2	7.3	-
With Implementation of Mitigation Measure M-AQ-1b, BAAQMD Exhaust Controls								
Stilling Basin – Excavation Soil Nail Shoring	54	804.6	6825.6	3326.4	0	81	64.8	1,018,375.2
Stilling Basin – Rock Anchors	24	213.6	1908	876	0	19.2	14.4	295,564.8
Stilling Basin – Concrete Placement, Slab and Walls	76	638.4	6163.6	2629.6	0	98.8	76	861,954.0
Toe of Dam – Lower Trailing Walls, Chute Blocks	22	184.8	1784.2	761.2	0	28.6	22	249,513.0
Top of Dam – Demolish Parapet Wall	40	112	684	524	0	16	8	81,852.0
Top of Dam – Core Drill/Place/Grout Anchors in Parapet, Ogee, Bridge	55	522.5	4697	2057	0	44	33	708,851.0
Top of Dam – Concrete in Parapet Walls and Bridge Piers	37	44.4	288.6	185	0	14.8	7.4	36,604.0
Top of Dam – Forms and Concrete Placement for Ogee Weir	43	86	627.8	378.4	0	21.5	12.9	82,151.5
Stilling Basin Metal Railings and Riprap	15	67.5	627	286.5	0	10.5	7.5	86,031.0
Sampling Station #5 – Fine Grading	40	2.0	13.3	9.0	0.0	0.5	0.2	1,449.9
Sampling Station #5 – Construction	40	3.0	14.4	13.0	0.0	0.2	0.2	1,884.8
Total Pounds		2,678.8	23,633.5	11,046.1	0	335.1	246.4	3,424,231.7
Average Pounds Per Day (168 days)		15.9	**140.7**	65.8	0.0	2.0	1.5	-
Proposed BAAQMD Significance Thresholds, pounds per day (BAAQMD, 2009)		54	54	-	-	82	54	

NOTE: **Boldface** type indicates emissions would exceed the applicable significance threshold. Estimated emissions include fugitive dust and equipment exhaust emissions generated by on-site construction activities as well as exhaust emissions from off-site truck operations.

[a] Fugitive emissions plus equipment exhaust

SOURCE: Orion, 2010 (based on URBEMIS2007 Model, Output in Appendix G)

Evaluation with Proposed BAAQMD Guidelines. Due to the expected adoption of the proposed BAAQMD CEQA Guidelines in some form in early 2010 (which, as currently drafted, include new quantitative significance thresholds for construction-related emissions), this EIR includes a quantitative analysis of the project's construction emissions to determine the project's consistency with proposed thresholds. In accordance with the proposed BAAQMD CEQA Guidelines, the CARB computer model, URBEMIS2007, was used to calculate exhaust emissions associated with each construction phase (model outputs are summarized in **Appendix G**). On-road emissions were calculated using the EMFAC 2007 computer model for a vehicle fleet (specific to the Bay Area) operating in 2012. A summary of total emissions for principal construction phases at both the LCSD and sampling station sites is presented in Table 5.8-4.[6] As indicated in this table, total project-related construction emissions would exceed the BAAQMD's proposed significance threshold for NOx, but would not exceed proposed thresholds for any other criteria pollutants. This exceedance of the NOx threshold would be a potentially significant impact. With implementation of BAAQMD exhaust controls presented in Mitigation Measure M-AQ-1b (Exhaust Control Measures), the project's construction-related exhaust emissions could be reduced to 140.5 pounds per day, but mitigated levels (as shown in Table 5.8-4) would still exceed the proposed BAAQMD threshold for NOx of 54 pounds per day, requiring additional mitigation. In accordance with the draft proposed guidelines, implementation of Mitigation Measure M-AQ-1c (Additional Exhaust Control Measures) could reduce NOx levels by an additional 30 to 40 percent (to approximately 84 to 98 pounds per day). However, the NOx emissions would not be reduced to less than the proposed BAAQMD significance threshold of 54 pounds per day, even with implementation of all reasonably available mitigation measures. Therefore, under the proposed BAAQMD guidelines, the project's construction-related NOx emissions would be *significant and unavoidable.*

Impact AQ-2: Generation of diesel particulate matter (DPM) and toxic air contaminants (TACs) during construction.

Lower Crystal Springs Dam Vicinity

Diesel-powered construction equipment and haul trucks would emit DPM and other toxics produced by combustion. A health risk assessment (HRA) for DPM and other toxic air contaminants[7] (TACs) in equipment exhaust was conducted using standard protocols specified by the BAAQMD, CARB, and the California Office of Environmental Health Hazard Assessment (OEHHA). The HRA used the HARP computer model, initialized with project emissions data and localized meteorology. The HARP model calculates the atmospheric dispersion on an hour-by-hour basis for at least one full year of data. The predicted annual average DPM and other TAC concentrations were then combined with the individual cancer risk factor for DPM exposure assuming that the maximum exposed individual would remain at the same location outside his or her residence for 24 hours per day, 350 days per year, for the entire 9-month duration of project construction (worst-case exposure).

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[6] The model outputs for off-road exhaust runs and the summary of on-road emissions are included in Appendix G.

[7] Other TACs present in equipment exhaust include benzene, formaldehyde, polycyclic aromatic hydrocarbons, acetaldehyde, acrolein, 1,3-Butadiene, chlorobenzene, propylene, hexane, toluene, xylenes, ethylbenzene, and hydrochloric acid,

The results of the HARP model analysis showed that emissions from operation of diesel-powered equipment at the LCSD construction site would result in increased cancer risk of 2.35 cases per million people and acute risk of less than 1 at the closest residences to the project site, located northeast of the LCSD and east of I-280 (see Appendix G, Health Risk Assessment for LCSDI). Exposure to construction-related DMP as well as any associated increased cancer risk would be relatively lower at more distant residences and schools (e.g., Odyssey Middle School and Highlands Elementary School) located farther to the east. The BAAQMD considers a risk of 1 in a million people to be insignificant, and a risk of 10 in a million people to be significant.[8] Because the estimated cancer risk of 2.35 cases per million people is less than the BAAQMD's adopted and proposed 10 cases per million people threshold, DPM emissions associated with project construction would be *less than significant.* The acute risk health index (HI) of less than 1 is also below the BAAQMD's adopted and proposed acute risk health index significance threshold and would therefore also be *less than significant.*

The HARP model also showed that emissions from haul trucks traveling between the construction site and the Allied Waste Ox Mountain Sanitary Landfill in Half Moon Bay would result in increased cancer risk of less than 1 case per million people and acute risk of less than 1 at the closest residences to the haul route (those located on the north and south sides of Highway 92 about 1 mile east of landfill site; see Appendix G). A cancer risk of less than 1 case per million people is less than the BAAQMD's adopted and proposed 10 cases per million people threshold and thus would be *less than significant.* The acute risk HI of less than 1 is below the BAAQMD's adopted and proposed acute risk health index significance threshold and would also be *less than significant.* This calculation assumes that no substantial improvements in DPM controls would be implemented over the lifetime of the construction project. However, it should be noted that multiple statewide DPM control programs[9] have been adopted and are in various stages of implementation that if implemented would reduce any public health risk associated with project-related haul truck operations.

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[8] The BAAQMD's Regulation 2, Rule 5, *New Source Review of Toxic Air Contaminants,* specifies that a cancer risk of 1 in a million or less (over a 70-year-lifetime exposure period) is an insignificant risk, and no further review of health-related impacts is required. If a project has a risk greater than 1 in a million, it must be further evaluated to determine acceptability. Factors that affect acceptability include the presence of controls on the rate of emissions, the location of the site in relation to residential areas and schools, and contaminant reductions in other media such as water. In general, projects with risks greater than 1 in a million but less than 10 in a million are approved if other determining factors are acceptable. Projects with risks greater than 10 in a million are generally not approved. Projects that are not approved may be reevaluated if emissions are reduced, thus reducing their risks. This BAAQMD rule also specifies that an acute risk hazard index of 1.0 or less is less than significant, and no further review is required.

[9] The Diesel Risk Reduction Plan was adopted by the CARB in 2000 and calls for reducing 2000 DPM levels by 75 percent by 2010 and 85 percent by 2020. The plan contains new regulatory standards and retrofit requirements (where feasible and cost effective) for all new on-road, off-road, and stationary diesel-fueled engines and vehicles to reduce DPM emissions by about 90 percent, overall, from current levels; and new Phase 2 diesel fuel regulations to reduce the sulfur content levels of diesel fuel to no more than 15 ppm to provide the quality of diesel fuel needed by the advanced DPM emission controls.

Sampling Station #5 Vicinity

Use of diesel-powered construction equipment and haul trucks at the Sampling Station #5 site would be substantially less in both magnitude and duration in comparison to usage at the LCSD site. Because the results of the TAC analysis for the LCSD site determined the impact to be less than significant, it can reasonably be deduced that this impact at the Sampling Station #5 site is also *less than significant*, and no quantitative analysis is needed.

Impact AQ-3: Odors generated during project construction.

The LCSDI project would not include any activities where water could stagnate to create potential odor. The project also would not include any building materials such as tar or asphalt that are intrinsically odorous. The analysis below applies to both the adopted and proposed BAAQMD guidelines, since there would be no changes to the odor guidelines in the proposed guidelines.

Lower Crystal Springs Dam Vicinity

Combustion emissions from the use of diesel fuel in construction equipment could generate localized objectionable odors, but the closest residences are a minimum of 450 feet away from the nearest construction site and approximately 1,100 feet from the stilling basin and LCSD where most of the construction activities would occur. Given local meteorological conditions and these setback distances, there would be sufficient dispersion and atmospheric mixing so that potential impacts associated with equipment exhaust odors would be *less than significant*.

Sampling Station #5 Vicinity

At the Sampling Station #5 site, the closest sensitive receptors would be visitors to the Pulgas Water Temple, about 100 feet away. However, given the limited use of construction equipment and short duration of construction activities at this site, potential impacts associated equipment exhaust odors would also be *less than significant* at this site.

Impact AQ-4: GHG construction emissions and conflicts with any applicable plans, policies, or regulations adopted for the purpose of reducing GHG emissions.

The majority of project construction activities at the LCSD site are scheduled to occur over a 9-month period, and the resulting exhaust emissions from off-road equipment, on-road trucking, and construction worker commute traffic during this period are expected to contribute minimally to long-term regional increases in GHGs. As described above in Section 5.8.3.2, no state or regional air quality agency has adopted a methodology or quantitative threshold (such as those that exist for criteria pollutants) that can be applied to a specific development or construction project to evaluate the significance of an individual project's contribution to GHG emissions. The BAAQMD's proposed CEQA Air Quality Guidelines also do not specify thresholds of significance for construction-related GHG emissions. However, proposed guidelines encourage implementation of construction GHG reduction strategies where feasible. In the future, the BAAQMD will likely develop a list of best management practices, such as alternative fuels, local materials, and recycling of construction and demolition waste, to reduce construction-related GHG emissions.

Despite the absence of adopted or proposed quantitative thresholds for construction-related GHG emissions, this analysis quantifies the estimated GHGs that would be emitted during project construction for informational purposes. Construction-related traffic and off-road construction equipment would also contribute incrementally to regional increases in GHG emissions and associated climate change effects. **Table 5.8-5** shows estimated project-related daily and total GHG emissions at both the LCSD and sampling station sites based on total CO_2 emissions estimates for the project (Tables 5.8-4 and 5.8-5), U.S. EPA CO_2 emission factors for diesel and gasoline fuel internal combustion, and California Climate Action Registry for N_2O and CH_4. This table indicates that project construction would generate 1,587 metric tons of CO_2E emissions. The 2006 statewide annual GHG inventory is estimated at 484,000,000 metric tons of CO_2E, while the 2007 Bay Area inventory is estimated at approximately 103,000,000 metric tons. Project-related total construction emissions (up to 1,587 metric tons per year) would represent 0.0003 percent of the statewide total and 0.002 percent of the Bay Area total.

TABLE 5.8-5
ESTIMATED GREENHOUSE GAS EMISSIONS DURING CONSTRUCTION

	Project GHG (CO_2-Equivalent) Emissions	
GHG	Daily CO_2-Equivalent Emissions (Tons/Day)	Total CO_2-Equivalent Emissions (Metric Tons), 2011 – 2012
CO_2	9.25	1,554
N_2O	0.07	29
TOC (CH_4)	0.01	4
Total	9.31	1,587

NOTES:
CO_2 = carbon dioxide
N_2O = nitrous oxide
TOC = total organic compounds
CH_4 = methane
NO_x = emitted from high-temperature sources such as diesel combustion consists of less than 1 percent N_2O. TOC consists of methane, ethane, and several other compounds. This analysis assumes that all TOC emitted during project construction would be methane.

SOURCE: U.S. EPA, 2006; California Climate Action Registry, 2009.

The contribution of GHG emissions from project construction would be extremely small relative to both statewide and Bay Area GHG emissions. The proposed project would also be subject to the existing CARB regulation (Title 13 of the California Code of Regulations, Section 2485), that limits idling of diesel-fueled commercial motor vehicles; compliance with this regulation would further reduce GHG emissions associated with project construction vehicles.[10]

The proposed project would not conflict with the state's goal to reduce GHG emissions to 1990 levels by 2020 and the City's requirement to reduce GHG emissions by 80 percent below 1990 levels by 2050, given the small quantity of GHGs that would be emitted from the project during construction (see Table 5.8-6). In addition, implementation of SFPUC GHG Reduction Actions (see Chapter 3, Project Description, Section 3.6.8, Greenhouse Gas Reduction Actions) as well as exhaust control measures presented in Mitigation Measures M-AQ-1b (Exhaust Control Measures) and M-AQ-1c (Additional Exhaust Control Measures) would further reduce construction-related GHG emissions. Therefore, the impact is considered *less than significant* at both the LCSD and sampling station sites under both the adopted and proposed BAAQMD guidelines.

5.8.3.5 Operational Impacts

Impact AQ-5: Air pollutant and odor emissions during project operation.

The proposed dam improvement project would result in a functional equivalent of the existing dam. Future activities at the improved dam would be essentially the same as the existing operations, maintenance, and inspection activities with respect to air pollutant emissions. Similarly, there would be no changes from current operations at Sampling Station #5 following completion of construction. Therefore, there would be no change in operational air quality effects or odor potential from existing conditions due to implementation of the proposed LCSDI project. Therefore, the project's operational impacts related to air pollutant emissions and odors would be *less than significant* under both the adopted and proposed BAAQMD guidelines.

Impact AQ-6: GHG operational emissions and conflicts with any applicable plans, policies, or regulations adopted for the purpose of reducing GHG emissions.

The project would not generate operational emissions associated with increased power demands, and, therefore, would not result in an increase in secondary GHG emissions related to power generation. However, the loss of vegetation (trees, scrub, grassland, wetlands) or biomass from inundation effects due to the proposed raising of the water level in the reservoir would result in an incremental reduction in carbon sequestration effects (normally considered a net climate benefit) as existing vegetation surrounding the reservoir is submerged and habitats in the inundation zone are converted from one type to another. Overall, the proposed increase in reservoir operating levels would result in a net loss of terrestrial vegetation around the perimeter of Crystal Springs Reservoir and an increase in open water/lacustrine habitat (see Section 5.13, Biological Resources, for discussion and analysis of operational impacts on vegetation). The loss of biomass from habitat conversion due to inundation would result in increased GHG emissions as sequestered carbon is released from affected vegetation (particularly trees). In addition to these inundation-related CO_2 emission increases (expected to occur over the first four years after project completion when proposed operations are scheduled to be fully implemented), subsequent periodic water level exceedances above the maximum normal operating level would result in additional loss of trees and associated carbon sequestration benefits. This additional tree loss and associated release of sequestered carbon are conservatively assumed to occur over the next five to ten years for the purposes of this analysis.

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[10] As noted earlier, there are 12 exceptions to this requirement (e.g., emergency situations, military uses, adverse weather conditions, etc.), including: when a vehicle's power takeoff is being used to run pumps, blowers, or other equipment; when a vehicle is stuck in traffic, stopped at a light, or under direction of a police officer; when a vehicle is queuing beyond 100 feet from any restricted area; or when an engine is being tested, serviced, or repaired.

The effects of loss of biomass on GHG emissions can be estimated using the Forest Project Protocol (Climate Action Reserve, 2009) to convert biomass to elemental carbon and its subsequent oxidation to CO_2. The amount of biomass loss was determined using the results of the biological resources operational impacts presented in Section 5.13.3.5, which provides the estimated change in acreages of the affected vegetation types, and using literature on fire ecology to convert acres of vegetation types to biomass in tons per acre (see Appendix G of this EIR for further description). The results of this analysis, presented in **Table 5.8-6**, indicates that the net increase in GHG emissions associated with the loss of biomass is estimated to be 610 metric tons CO_2 per year for the first four years and 57 to 114 metric tons CO_2 per year for the subsequent five to ten years. This estimate is based on the net effects that are predicted to occur as affected vegetation types would experience conversion from one vegetation type to another (e.g., conversion from woodlands to grassland, or conversion of *Scirpus/Typha* to herbaceous wetland) in response to changes in inundation patterns.

As indicated above, no state or regional air quality agency has adopted a methodology or quantitative threshold (such as those that exist for criteria pollutants) that can be applied to a specific development or construction project to evaluate the significance of an individual project's contribution to GHG emissions. Although the predicted loss of biomass associated with proposed reservoir operations would result in the temporary loss of carbon sequestration effects, proposed replacement tree plantings and habitat creation/enhancement measures (see Section 5.13, Biological Resources, Mitigation Measures M-BI-1c [Wetland Creation and Enhancement]; M-BI-7a [Serpentine Grasslands Enhancements]; and M-BI-7b [Oak Woodland Mitigation Program]) would eventually restore carbon sequestration benefits and either partially or completely offset these losses.

The BAAQMD's proposed CEQA Air Quality Guidelines specify a threshold of 1,100 metric tons of CO_2-E per year for operational GHG emissions for land use development projects (e.g., residential, commercial, industrial, and public land uses and facilities) and 10,000 metric tons per year for stationary sources (e.g., projects involving processes or equipment that emit GHG emissions). Neither of these thresholds addresses GHG effects associated with loss of biomass and carbon sequestration; thus, these thresholds would not apply to the proposed project. Regardless, comparison of the project's operational GHG effects with either of these thresholds

TABLE 5.8-6
ESTIMATED GREENHOUSE GAS EMISSIONS DUE TO REDUCTION IN BIOMASS FROM PROPOSED OPERATIONS

Vegetation Types and Net Change in Acreage	Biomass Load (Tons Per Acre)	Biomass (Tons)	Carbon and CO_2 Emissions (Metric Tons)
Effects from Increased Maximum Normal Operating Level (First Four Years)			
Upland Forest: -31.1 acres	23	-715	
Upland Scrub: -13.8 acres	12	-166	
Grassland: -21.0 acres	1.5	-32	
Riparian: -7.7 acres	23	-177	
Scirpus/Typha: -8.0 acres	30	-240	
Herbaceous Wetland: 2.3 acres (net gain)	0.2	0.5	
Total Loss of Biomass: 79.4 acres		1,329	
Carbon Component of Biomass[a]			665
Total Equivalent CO_2 Emissions[b]			2,439
Annual CO_2 Emissions			**610**
Effects from Exceedances (Subsequent Five to Ten Years)			
Upland Forest: -19.1 acres	23	-493	
Upland Scrub: 9.5 acres (net gain)	12	114	
Grassland: 9.6 acres (net gain)	1.5	14	
Total Loss of Biomass: (no change in acreage)		311	
Carbon Component of Biomass[a]			155
Total Equivalent CO_2 Emissions[b]			571
Annual CO_2 Emissions			**57 - 114**

NOTES:

[a] Carbon = 0.5 tons of carbon weight per ton of biomass

[b] CO_2 = 3.67 tons of CO_2 per ton of carbon (based on molecular weights of CO_2 and carbon)

SOURCE: See Section 5.13.3.5, Biological Resources Operational Impacts for assumptions used to estimate vegetation loss and Appendix G for conversions to biomass load; Climate Action Reserve, 2009 for biomass to carbon conversion.

indicates that the project's operational GHG effects would be well below these levels. Project-related total operations emissions (up to 610 metric tons per year) would represent a negligible fraction of both the statewide and Bay Area annual GHG inventory.

As noted above, proposed replacement tree plantings and habitat enhancement measures (see Section 5.13.3.6, Biological Resources Mitigation Measures) would eventually restore carbon sequestration benefits and either partially or completely offset these losses (although a temporal loss of carbon sequestration benefits would occur until restoration plantings become established and mature sufficiently). Therefore, in the long term, the proposed project would not conflict with the state's goal to reduce GHG emissions to 1990 levels by 2020 and the City's requirement to reduce GHG emissions by 80 percent below 1990 levels by 2050, given the limited loss and duration of carbon sequestration effects that would occur under proposed project operation with implementation of mitigation measures described above. Therefore, the proposed project would not conflict with state and local plans, policies or regulations related to reducing GHG emissions, and the project's impact is considered to be *less than significant.* Furthermore, as stated above in Section 5.8.2.2, the CCSF has adopted an ordinance establishing GHG emission targets and action plans to reduce GHG emissions by set percentages below 1990 levels by specific years, and the SFPUC is developing energy-efficiency and renewable generation projects that would reduce long term GHG emissions from SFPUC facilities.

5.8.3.6 Mitigation Measures

Mitigation Measure M-AQ-1a: Dust Control Measures.

The SFPUC shall include these measures in contract specifications, where applicable:

- All active construction areas shall be watered at least twice daily.
- All trucks hauling soil, sand, and other loose debris shall be covered.
- All unpaved access roads, parking areas, and staging areas at construction sites shall either be paved, watered three times daily, or nontoxic soil stabilizers shall be applied.
- All visible mud or dirt track-out onto adjacent public roads shall be swept at least once per day with wet power vacuum sweepers.
- All vehicle speeds on unpaved roads shall be limited to 15 mph.

Mitigation Measure M-AQ-1b: Exhaust Control Measures.

To limit exhaust emissions associated with the project, the SFPUC shall implement the following exhaust controls, where applicable:

- Contract specifications shall include Sections 2480 and 2485, Title 13, California Code of Regulations, which limit the idling of all diesel-fueled commercial vehicles (weighing over 10,000 pounds, both California- or non-California-based trucks) to 30 seconds at a school or five minutes at any location. In addition, the use of diesel auxiliary power systems and main engines shall be limited to five minutes when within 100 feet of homes or schools while the driver is resting. Clear signage shall be provided for construction workers at all access points.
- Contract specifications shall include Section 93115, Title 17, California Code of Regulations, Airborne Toxic Control Measure for Stationary Compression Ignition Engines, which specifies fuel and fuel additive requirements; emission standards for operation of any stationary, diesel-fueled, compression-ignition engines; and operation restrictions within 500 feet of school grounds when school is in session.
- A schedule of low-emissions tune-ups shall be developed, and such tune-ups shall be performed on all equipment, particularly haul and delivery trucks. A log of required tune-ups shall be maintained, and a copy of the log shall be submitted to the SFPUC.

- Low-sulfur fuels shall be used in all stationary and mobile equipment.

Mitigation Measure M-AQ-1c: Additional Exhaust Control Measures

If proposed BAAQMD CEQA Guidelines are adopted and in effect at the time of EIR certification, the SFPUC shall implement the following BAAQMD-specified exhaust controls in addition to those controls specified in Mitigation Measure M-AQ-1b to reduce exhaust emissions associated with the project:

- Limit idling time of diesel powered construction equipment to two minutes. (If proposed BAAQMD CEQA Guidelines are adopted and in effect at the time of EIR certification, this measure shall supersede the condition in Mitigation Measure M-AQ-1b which limits idling to five minutes at any location other than a school.)
- The SFPUC shall implement additional mitigation measures to reduce exhaust emissions of NO_x from construction activities. The SFPUC shall ensure that construction contract specifications include a requirement that on-road diesel trucks used to transport spoils consist of 2004 or newer model-year trucks with factory-built engines. All on-road diesel trucks will be required to have emission control labels as specified in 13 CCR 2183(c). The construction contract specifications will require that the contractor submit to the SFPUC a comprehensive inventory of all on-road trucks used to haul spoils. The inventory will include each vehicle's license plate number, the engine production year, and a notation of whether the truck is in possession of an emission control label as defined in 13 CCR. The contractor shall update the inventory and submit it monthly to the SFPUC throughout the duration of the project.
- The SFPUC shall ensure that construction contract specifications include a requirement that all off-road terrestrial diesel construction equipment (with the possible exception of certain types of very specialized construction equipment for which controls are not commercially available), is equipped with Tier 2 or 3 diesel engines as defined in 13 CCR 2485 and are equipped with Level 3 Diesel Emission Control Strategies as defined in 13 CCR 2700–2710. The construction contract specifications will require the contractor to submit a comprehensive inventory of all off-road construction equipment that will be used an aggregate of 8 hours or more during any portion of project construction. The inventory will include each vehicle's license plate number, horsepower rating, engine production year, and projected hours of use or fuel throughput for each piece of equipment. The contractor shall update the inventory and submit it monthly to the SFPUC throughout the duration of the project.

5.8.3.7 Cumulative Impacts

Impact C-AQ: Cumulative construction emissions of criteria pollutants, toxic air contaminants, and greenhouse gas emissions.

The geographic scope of potential cumulative air quality impacts encompasses the San Francisco Bay Area Air Basin for criteria pollutants and the immediate project site vicinity for diesel particulates. The geographic scope for GHG emissions, while theoretically global in extent, is considered in regional and statewide terms for practical purposes.

Criteria Pollutants

The SFBAAB's nonattainment status for ozone, PM_{10}, and $PM_{2.5}$ indicates that a significant cumulative air quality impact exists in the air basin. When project-related construction emissions are considered together with concurrent construction emissions associated with other projects listed in Table 5.1-1 in Section 5.1.4 (including other SFPUC water facility projects in the vicinity), cumulative short-term emissions of criteria pollutants (including ROG, NO_x, PM_{10}, and $PM_{2.5}$) would increase and impacts would be potentially significant because of the region's nonattainment status for ozone and suspended particulates (PM_{10} and $PM_{2.5}$). Under the adopted BAAQMD CEQA Guidelines, the LCSDI project's incremental contribution to nonattainment of ozone and suspended particulates would be reduced to a less-than-significant level with implementation of Mitigation Measures M-AQ-1a (Dust Control Measures) and M-AQ-1b (Exhaust Control Measures); therefore, the LCSDI project's contribution to cumulative air quality impacts related to emissions of ozone, PM_{10}, and $PM_{2.5}$ would not be cumulatively considerable and would be *less than significant*, under the adopted BAAQMD guidelines.

However, project-related construction emissions would exceed the BAAQMD's proposed significance threshold for NO_x. When compared to the BAAQMD's proposed threshold for NO_x, implementation of Mitigation Measure M-AQ-1b (Exhaust Control Measures) would not reduce the project's incremental increase in NO_x to a less-than-significant level and the project's contribution of NO_x, an ozone precursor, would contribute to the region's nonattainment status of ozone. With implementation Mitigation Measures M-AQ-1b (Exhaust Control Measures) and M-AQ-1c (Additional Exhaust Control Measures), the project's construction-related exhaust emissions would still exceed the proposed BAAQMD threshold for NO_x and the project's NO_x contribution to cumulative air quality impacts and to regional air quality conditions would be *significant and unavoidable*. There are no other feasible mitigation measures available to further reduce cumulative NO_x emissions to below the BAAQMD proposed significance threshold for NO_x.

Toxic Air Contaminants

Construction of several cumulative projects (e.g., SFPUC's New Crystal Springs Bypass Tunnel [NCSBT] project, SFPUC's Crystal Springs Pipeline No. 2 [CSPL2] Replacement project, and SFPUC's Crystal Springs/San Andreas [CSSA] Transmission Upgrade project) could occur at the same time as the LCSDI project, and all of these projects could overlap in the LCSD vicinity and/or along the Crystal Springs Road/Polhemus Road truck haul route. Construction activities associated with these projects would result in cumulative localized increases in DPM, a TAC. The closest downwind sensitive receptors that would be subject to DPM emissions would be residences located east of the dam on both sides of Crystal Springs Road, and Odyssey School, located at the Crystal Springs Road/Polhemus Road intersection. The combined DPM emissions associated with the NCSBT, LCSDI, CSPL2 Replacement, and CSSA Transmission Upgrade projects would have the potential to exceed the adopted BAAQMD significance threshold of 10 in one million,[11] but required implementation of Sections 2480 and 2485, Title 13, California Code of

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[11] The LCSDI's risk would be 2.35 in a million, while the NCSBT's excess cancer risk would be up to 10 chances in a million (San Francisco Planning Department, 2007), the CSSA's risk would be 0.1 in a million (San Francisco Planning Department, 2009),and the CSPL2's risk would be well below 1 in a million.

Regulations, restricting idling of trucks for 30 seconds or less in front of a school or five minutes at any location (also specified in Mitigation Measure M-AQ-1b), would reduce this project's potential DPM emissions to less-than-significant levels. In addition, required implementation of exhaust controls (Mitigation Measures M-AQ-1b and M-AQ-1c) as part of the LCSDI project would reduce the project's contribution to cumulative DPM emissions so that the LCSDI project's residual contribution to cumulative construction-related DPM emissions would be less than cumulatively considerable and therefore, *less than significant* under adopted BAAQMD significance thresholds for TACs/DPM.

Under the proposed BAAQMD significance thresholds, the cumulative local community risk and hazard impacts on residential and school receptors would be significant if the excess cancer risk exceeds 100 in a million, the non-cancer risk exceeds a Hazard Index of 1.0, and all existing, proposed, and future sources of DPM within 1,000 feet of a receptor exceed an ambient annual average $PM_{2.5}$ concentration of 0.8 $\mu g/m^3$ (BAAQMD, 2009). The proposed thresholds, unlike adopted thresholds, are an absolute threshold for all sources within the 1,000-foot zone of influence, whereas the adopted thresholds are for evaluation of an individual project's contribution. The proposed thresholds do not specify a threshold for determining the significance of a project-specific contribution when a cumulative threshold is exceeded. For the purposes of this analysis, when using the proposed thresholds, a conservative assumption has been made that *any* contribution of TAC emissions would be cumulatively considerable if a cumulative threshold would be exceeded when all TAC sources within 1,000 feet of the project are considered.

As mentioned above, the proposed thresholds define a 1,000-foot zone of influence for evaluation of cumulative TAC emissions. Thus, the 1,000-foot zone of influence is defined as any location within 1,000 feet of where the project would emit construction emissions containing TACs, i.e. DPM in this case. Within the zone of influence, existing sources (such as roadways), present and future cumulative projects, as well as the proposed project could all contribute DPM emissions. Major cumulative sources within 1,000 feet of LCSDI site include the CSSA Transmission Upgrade project and Site 1 from the CSPL2 Replacement project, as well the I-280 freeway, Crystal Springs Road, and Skyline Boulevard. Most sensitive receptors are located more than 1,000 feet from the existing LCSD, but there are some residences located within 1,000 feet of the LCSDI construction area, including residences both north and south of Crystal Springs Road and recreationists using the Sawyer-Camp Trail. Since the excess cancer risk associated with freeways alone can exceed the proposed BAAQMD threshold of 100 chances in a million within 500 feet (CARB, 2005), it is possible that the freeway by itself would exceed the proposed BAAQMD significance threshold for DPM. Although I-280 has a relatively lower truck fraction of overall traffic compared to other freeways (i.e., U.S. 101 or I-80) and lower attendant health risks, any additional DPM emissions resulting from SFPUC projects in the LCSD vicinity (within 500 feet of I-280) could be cumulatively considerable since it could contribute to existing exceedance of this threshold. Although DPM emissions from the LCSDI project were determined to be less than significant when compared to proposed thresholds, the cumulative DPM emissions from all sources within 1,000 feet of affected sensitive receptors could still exceed the proposed threshold and, therefore, are conservatively considered to be *potentially significant and unavoidable* under the proposed BAAQMD guidelines.

There are no feasible mitigation measures available to further reduce cumulative DPM emissions within 500 feet of I-280 beyond implementation of exhaust controls (Mitigation Measures M-AQ-1b and M-AQ-1c).

Greenhouse Gases

The project's GHG emissions would contribute to cumulative climate change effects as described under Impacts AQ-4 (construction emissions) and AQ-6 (operational impacts). Under these impact discussions, the project's GHG emissions were determined to be less than significant when compared to regional and statewide GHG emissions, as well as proposed BAAQMD significance thresholds for GHGs. Therefore, the project's contribution to cumulative GHG emissions and associated climate change impacts would not be cumulatively considerable *(less than significant).*

5.8.4 References

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5.9 Wind and Shadow

This section analyzes potential impacts related to wind and shadow that could occur during construction and operation of the proposed Lower Crystal Springs Dam Improvements (LCSDI) project and assesses the potential for project implementation to adversely affect existing wind and shadow patterns.

5.9.1 Setting

The proposed project is located entirely within SFPUC Peninsula watershed lands in unincorporated San Mateo County. The SFPUC Peninsula watershed encompasses 23,000 acres of open space lands used primarily for water collection, transmission, and storage; with the exception of SFPUC water supply facilities, groundskeepers' cottages, and ancillary structures, the Peninsula watershed is largely undeveloped. The Peninsula watershed contains heavily forested vegetation on its western slopes, and grassland and scattered woodlands on its eastern periphery. As described in Section 5.10, Recreation, the Peninsula watershed is generally not open to the public, with the exception of a few designated trails, bikeways, and recreational facilities. Due to the predominantly natural state of the project area, existing wind and shadow patterns are largely unaffected by development.

5.9.2 Regulatory Framework

There are no federal, state, or local regulations governing wind or shadow that apply to the LCSDI project. Although City and County of San Francisco (CCSF) regulations govern wind and shadow effects within the boundaries of San Francisco, these local regulations do not apply to the proposed LCSDI because the project is not located in San Francisco. Nevertheless, an overview of CCSF wind and shadow regulations is provided for informational purposes.

5.9.2.1 Wind

The San Francisco Planning Code establishes wind comfort and wind hazard criteria for use in evaluating new development in four areas of the city: the C-3 Downtown Commercial Districts (Section 148); the Van Ness Avenue Special Use District (Section 243[c][9]); the Folsom–Main Residential/Commercial Special Use District (Section 249.1); and the Downtown Residential District (Section 825).[1] As the project site is not located in any of these areas, the wind comfort and wind hazard criteria established in the Planning Code do not apply to the proposed project.

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[1] The cited San Francisco Planning Code sections provide that any new building or addition located in these areas of the city that would cause wind speeds to exceed the hazard level of 26-mph-equivalent (as defined in the Planning Code) for more than 1 hour of any year must be modified to meet this criterion. (The 26-mph standard accounts for short-term—3-minute averaged—wind observations at 36 mph as equivalent to the frequency of an hourly averaged wind speed of 26 mph. Winds over 34 mph make it difficult for a person to maintain balance, and gusts can blow a person over.) For CEQA purposes, the San Francisco Planning Department generally refers to the wind hazard criterion to determine the significance of wind effects related to new development in the city.

5.9.2.2 Shadow

San Francisco General Plan

The Recreation and Open Space Element of the San Francisco General Plan (1996) includes the following policy related to potential solar access or shading impacts:

> *Policy 2.3*: Solar access to public open space should be protected.

The policy promotes solar access and avoiding shade to maintain the usability of public open space. It states that the requirements of Planning Code Section 295 apply to the review of projects that could shade San Francisco Recreation and Park Department property. Policy 2.3 further states that:

> A number of other open spaces designated in this Element or elsewhere in the General Plan are under the jurisdiction of other public agencies, or are privately owned and therefore not protected by the Planning Code amendments. These spaces should be given other forms of protection to assure they are not shaded during the hours of their most intensive use. Any new shading should be remedied to the extent feasible by expanding opportunities for public assembly and recreation in indoor and outdoor settings.

The proposed project is not located on San Francisco Recreation and Park Department property, and none of the project components would affect areas accessible to the public. Therefore, these policies do not apply to the LCSDI project.

San Francisco Planning Code

Planning Code Section 295,[2] adopted in 1984 pursuant to voter approval of Proposition K (also known as the Sunlight Ordinance), prohibits the issuance of building permits for structures over

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[2] Planning Code Section 295 provides that: "The City Planning Commission shall conduct a hearing and shall disapprove the issuance of any building permit governed by the provisions of this Section if it finds that the proposed project will have any adverse impact on the use of the property under the jurisdiction of, or designated for acquisition by, the Recreation and Park Commission because of the shading or shadowing that it will cause, unless it is determined that the impact would be insignificant. The City Planning Commission shall not make the determination required by the provisions of this Subsection until the general manager of the Recreation and Park Department in consultation with the Recreation and Park Commission has had an opportunity to review and comment to the City Planning Commission upon the proposed project." As required by Planning Code Section 295, the Recreation and Park Commission and the Planning Commission adopted criteria in 1987 and 1989 for the review of shade, solar access, and shadow effects. According to those criteria, shadow is measured by multiplying the area of the shadow by the amount of time the shadow is present on the park, in units called "square-foot-hours." Determining the shadow impact caused by a project begins with a calculation of the number of square-foot-hours the project casts shadow on a protected property over the course of a year during each day, an hour after sunrise to an hour before sunset, summed over the course of a year, ignoring shadow from any surrounding structures and from clouds, fog, and solar eclipses. This is called the "Annual Available Sunlight" (AAS) for that park. The shadow impact of the project is defined as the shadow in square-foot-hours cast by the project divided by the AAS, expressed as a percentage. Further, in addition to quantitative criteria, the adopted criteria set forth qualitative criteria for the evaluation of shadow. Those criteria for assessing new shadow would be based on existing shadow profiles; important times of day; important seasons in the year; the location, size, and duration of new shadows; and the public good served by buildings casting new shadow. Also, the adopted criteria state that small parks, less than 2 acres in area, with existing shadow loads of 20 percent or larger, should not be subjected to additional shadow by new development. Larger parks (2 acres or more), with shadow loads between 20 percent and 40 percent, would have an additional new shadow budget of 0.1 percent. Larger parks with existing shadow loads of less than 20 percent would have an additional new shadow budget of 1.0 percent. The adopted criteria also include absolute cumulative limits for increase in percent shading for 14 parks in the downtown San Francisco area. Planning Code Section 295, *Presentation for Planning Commission Hearing on October 23, 2003* (San Francisco Planning Department) provides an overview of current procedures for Planning Department review of applications that are subject to Section 295; it includes a review of the Planning Code requirements and of the implementation document adopted jointly by the Recreation and Park and the Planning Commissions, and a description of the technical methodology for analysis of shadow impacts on protected properties.

40 feet in height that would cast shade or shadow on property under the jurisdiction of, or designated to be acquired by, the Recreation and Park Commission between 1 hour after sunrise to 1 hour before sunset at any time of year, unless the Planning Commission determines that the shade or shadow would have an insignificant adverse impact on the use of such property.

The project site is located in the Peninsula watershed, outside of San Francisco, and there are no parks or open spaces within the project site or vicinity that are under the jurisdiction of the San Francisco Recreation and Park Department. Therefore, the project would not be subject to review under Planning Code Section 295.

5.9.3 Impacts and Mitigation Measures

5.9.3.1 Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to wind and shadow, but generally considers that implementation of the proposed project would have a significant impact if it were to:

- Alter wind in a manner that substantially affects public areas; or
- Create new shadow in a manner that substantially affects outdoor recreation facilities or other public areas.

Due to the nature of the proposed project, there would be no impacts related to the impact criteria listed above for the reasons described below:

> *Alter Wind in a Manner that Substantially Affects Public Areas*. The proposed project involves modifying the existing parapet wall and constructing new spillway walls that would be higher in elevation than the existing walls. The parapet wall would increase by 9 feet (to a new top elevation of 302 feet), and the spillway walls would increase by 8 feet (to a new height of 291.8 feet). While the proposed project would increase the overall height of the dam, the new elevations of the parapet and spillway walls would not alter wind patterns to the degree that they would adversely affect public areas. The project would also include raising the height of Sampling Station #5 by 5 feet. The nearest public use area to the sampling station is the Pulgas Water Temple, which is not close enough to be affected by wind from this minor modification. Therefore, impacts related to altering wind in a manner that substantially affects public areas are not applicable.
>
> *Create New Shadow in a Manner that Substantially Affects Outdoor Recreation Facilities or Other Public Areas*. The project does not propose any features that would substantially affect shadow patterns. The proposed project would increase the overall height of the dam; however, the new elevations of the parapet and spillway walls would not be high enough to result in substantial new shadows that would affect outdoor recreational facilities or other public areas. Also, public access is not allowed below the dam, and the closest accessible recreational activity (i.e., bicycling) is on the roadway above the dam. The project would also include raising the height of Sampling Station #5 by 5 feet. The nearest public use area to the sampling station is the Pulgas Water Temple, which is not close enough to be affected by shadow from this minor modification. Therefore, impacts related to creating new shadow that substantially affects outdoor recreational facilities or other public areas are not applicable.

5.9.3.2 Impacts

As described above, implementation of the proposed project would not result in impacts related to wind and shadow. Therefore, there are no impacts under this topic.

5.9.3.3 Mitigation Measures

None required.

5.9.3.4 Cumulative Impacts

Implementation of the proposed project would not result in any cumulative impacts related to wind and shadow because the project would not result in any project-specific impacts related to this topic.

5.9.4 References

San Francisco General Plan, Recreation and Open Space Element, 1996.

5.10 Recreation

This section evaluates potential impacts on recreational resources that could result from implementation of the proposed project and identifies mitigation measures to reduce or avoid impacts, as appropriate. The analysis addresses publicly accessible recreational resources in the project area, including local roadways used for bicycling and designated recreational trails. This section also describes regulations pertinent to the proposed project.

5.10.1 Setting

The majority of the open space and recreational resources in the project area that could be affected by the proposed project are located on the Peninsula watershed lands owned by the City and County of San Francisco (CCSF) and managed by the SFPUC. The Peninsula watershed is generally not open to the public, with the exception of designated trails, bikeways, and recreational facilities located within the 4,000-acre Golden Gate National Recreation Area (GGNRA) Scenic and Recreation Easement in the eastern watershed, and designated trails in within the 19,000-acre GGNRA Scenic Easement in the western watershed. The Peninsula watershed is also part of the Golden Gate Biosphere Reserve, which is a National Recreation Area designated by the U.S. Department of the Interior and administered by the National Park Service. Please refer to Chapter 4, Plans and Policies, and Section 5.2, Land Use, for a description of the GGNRA easements and the Golden Gate International Biosphere Reserve. The GGNRA easements are shown in **Figure 5.2-1**. Several of the recreational trails in the project area are maintained and co-managed by the San Mateo County Department of Parks. Privately owned recreational resources in the project area include the Crystal Springs Golf Course and the Filoli Center.

Table 5.10-1 summarizes the recreational facilities, trails, and bicycle routes in the project area; these recreational resources are depicted in **Figure 5.10-1**.

5.10.1.1 Recreational Facilities

Crystal Springs Golf Course

The 18-hole Crystal Springs Golf Course, located on Golf Course Drive on the east side of Lower Crystal Springs Reservoir, extends approximately one to three miles north of the Lower Crystal Springs Dam (LCSD). Access to Golf Course Drive is via Interstate 280 (I-280) and Black Mountain Road, or via Skyline Boulevard. The golf course is located on CCSF-owned lands and managed by CourseCo, Inc., a privately owned golf management company (Crystal Springs Golf Course, 2009). The golf course is located within the GGNRA Scenic and Recreation Easement.

Lower Crystal Springs Dam Vista Point

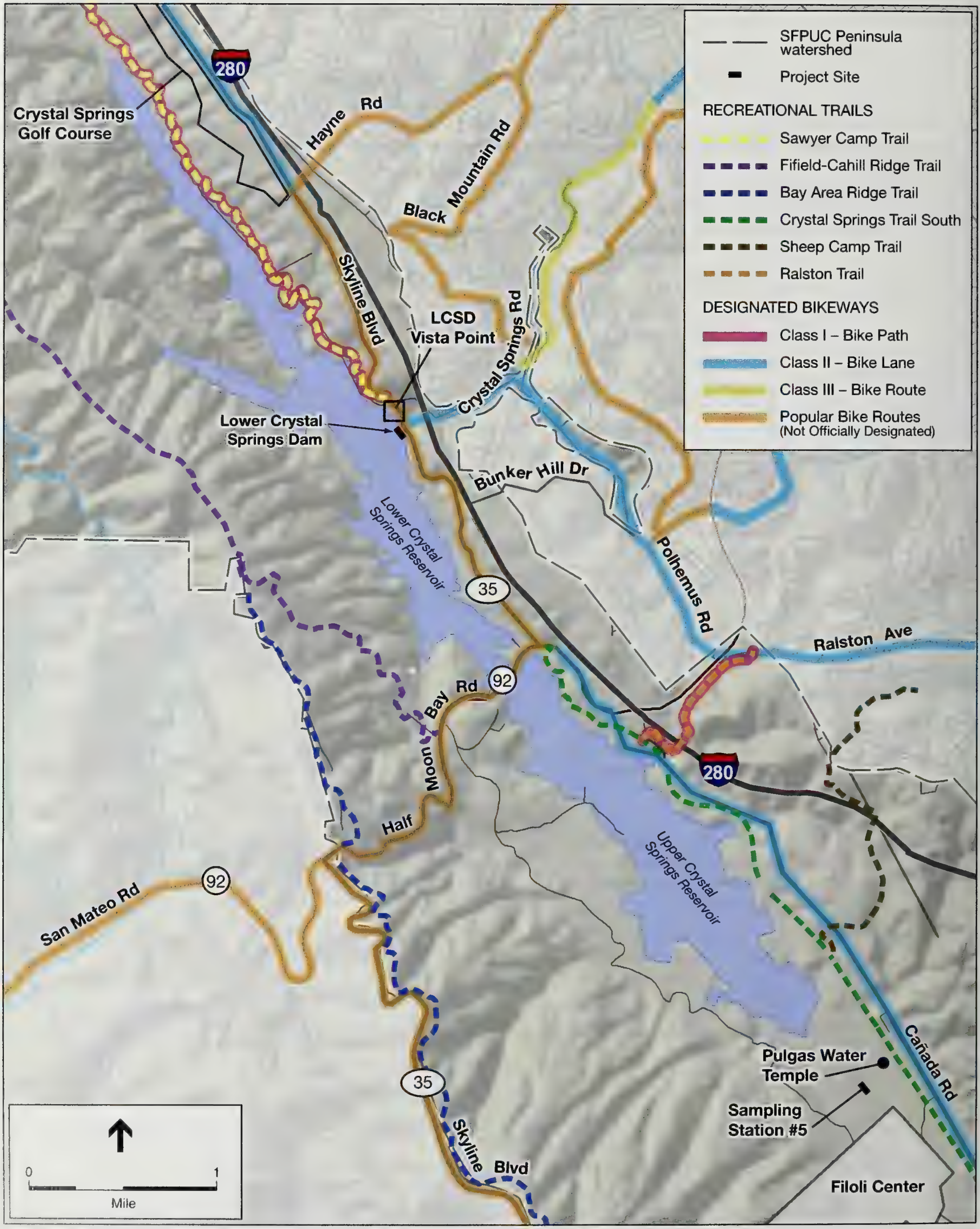
The LCSD vista point is located just north of the LCSD on Skyline Boulevard, immediately west of the Crystal Springs Road junction. The vista point overlooks Lower Crystal Springs Reservoir and SFPUC Peninsula watershed lands to the west. The vista point includes a parking lot with

TABLE 5.10-1
RECREATIONAL RESOURCES IN THE PROJECT AREA

Resource	Location	Activities / Facilities	Jurisdiction
Recreational Facilities			
Crystal Springs Golf Course	Golf Course Drive, between I-280 and Lower Crystal Springs Reservoir.	18-hole golf course; pro-shop; banquet and event facilities	SFPUC / CourseCo, Inc. (private lease)
LCSD Vista Point	Skyline Boulevard just west of the Crystal Springs Road junction, immediately north of the LCSD.	Designated viewing area of the Crystal Springs Reservoir and Peninsula watershed lands; parking and access to Sawyer Camp Trail	SFPUC/ San Mateo County Department of Parks
Pulgas Water Temple	Cañada Road, about 2 miles south of intersection of Highway 92 and I-280, at south end of Upper Crystal Springs Reservoir.	Recreational uses in park-like setting; permits available to the public for weddings and special events	SFPUC
Filoli Center	Cañada Road, about 0.5 mile north of Edgewood Road junction, at south end of SFPUC Peninsula watershed.	Tours of country house and formal gardens; nature hikes through nature preserve	National Trust for Historic Preservation
Recreational Trails			
Sawyer Camp Trail	Extends 6 miles from the LCSD vista point to Hillcrest Boulevard.	Designated Class I bikeway; paved multi-use trail for walking, bicycling, running, roller skating/blading, and horseback riding; portions of the trail parallel eastern shorelines of Lower Crystal Springs and San Andreas Reservoirs	SFPUC / San Mateo County Department of Parks
Bay Area Ridge Trail	In the project area, the trail generally follows Sawyer Ridge along the west side of Lower Crystal Springs and San Andreas Reservoirs and Skyline Boulevard on the east side of Upper Crystal Springs Reservoir; the Fifield-Cahill Ridge Trail is a part of this trail system.	Multi-use trail for mountain biking, walking, running, hiking, and horseback riding	Bay Area Ridge Trail Council
Fifield-Cahill Ridge Trail	Extends 10 miles along Sawyer Ridge between Highway 92 and Sheath Lane, on west side of Lower Crystal Springs and San Andreas Reservoirs.	Gravel service road; docent-led hikes on a reservation-only basis	SFPUC
Crystal Springs Trail South	Extends along Cañada Road on east side of Upper Crystal Springs Reservoir, between the intersection of Highway 92 and Skyline Boulevard to Huddart County Park.	Paved walking, running, and bicycle trail	SFPUC / San Mateo County Department of Parks
Ralston Trail	Extends south 1 mile from the interchange of Ralston Avenue and Highway 92 in Belmont to the Crystal Springs Trail South on the east side of Upper Crystal Springs Reservoir.	Designated Class I bikeway; paved walking, running, and bicycle trail	SFPUC / San Mateo County Department of Parks

TABLE 5.10-1 (Continued)
RECREATIONAL RESOURCES IN THE PROJECT AREA

Resource	Location	Activities / Facilities	Jurisdiction
Recreational Trails (cont.)			
Sheep Camp Trail	Extends 1.5 miles south from the Cross Country Running Course in the upper Belmont/San Carlos area to Crystal Springs Trail South, about 0.5 mile north of the Pulgas Water Temple and on the east side of Upper Crystal Springs Reservoir.	Unpaved walking, running, and mountain biking trail	SFPUC / San Mateo County Department of Parks
Bicycle Routes			
Skyline Boulevard (Highway 35) (San Mateo County scenic roadway)	Generally parallels the eastern edge of San Andreas and Lower Crystal Springs Reservoirs, crosses west across Upper and Lower Crystal Springs Reservoirs at Highway 92, and continues south along the west side of Upper Crystal Springs Reservoir to Summit Road in the Santa Cruz Mountains.	Designated Class II bikeway between Trousdale Drive, and its junction with Hayne Road and Black Mountain Road; all other segments are popular bicycle routes	Caltrans / San Mateo County
Highway 92 (Half Moon Bay Road) (San Mateo County scenic corridor)	Runs east-to-west and bisects Upper and Lower Crystal Springs Reservoirs.	Popular bicycle route	Caltrans / San Mateo County
Crystal Springs Road (San Mateo County scenic roadway)	Extends east-to-west from Maple Street in the city of San Mateo, to Skyline Boulevard in the vicinity of Sawyer Camp Trail and the LCSD.	Designated Class II bikeway between Skyline Boulevard and Polhemus Road, and between El Cerrito Avenue and Maple Street; Class III bikeway between Polhemus Road and El Cerrito Avenue	San Mateo County
Cañada Road (San Mateo County scenic roadway)	Extends north-to-south along east side of Upper Crystal Springs Reservoir from Highway 92 to Woodside Road.	Designated Class II bikeway; closed on Sundays for "Bicycle Sunday" (only non-auto travel is permitted)	San Mateo County
Polhemus Road	Extends south-to-north between the northern Ralston Avenue / Highway 92 interchange and Bunker Hill Drive, east of Lower Crystal Springs Reservoir.	Designated Class II bikeway	San Mateo County



SOURCE: ESA + Orion, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.10-1
Recreational Resources in the Project Area

11 parking spaces, informational signage, benches, and access to the southern entrance to Sawyer Camp Trail (described below). The parking lot is heavily used by Sawyer Camp Trail recreationists, especially on weekends. The vista point is located on CCSF-owned lands and within the GGNRA Scenic and Recreation Easement.

Pulgas Water Temple

The Pulgas Water Temple marks the western terminus of the Hetch Hetchy Aqueduct and provides recreational uses in a unique, park-like setting. The parking lot and walk-in gates are open to the public on weekdays from 9 a.m. to 4 p.m.; with the exception of permitted events on Saturdays, only the walk-in gate is open on weekends. Two-hour event permits are granted for weddings on Saturdays between April and October, and parking is restricted to wedding guests. A maximum of two event permits per Saturday are issued, and during the summer months there are often two weddings each Saturday at the Pulgas Water Temple. Permits are not available on Sundays (SFPUC, 2009a).

The Pulgas Water Temple and associated facilities are owned and managed by the SFPUC. Existing facilities and features include public restrooms, drinking water fountains, visitor parking, a rectangular tree-lined reflecting pool, and landscaping. The site is accessible by car or bicycle from Cañada Road, or by foot on Crystal Springs Trail South (SFPUC, 2009a). The Pulgas Discharge Channel and existing Sampling Station #5 are located immediately west of the Pulgas Water Temple but are not publicly accessible.

Filoli Center

The Filoli Center is located at the south end of the SFPUC Peninsula watershed on Cañada Road, approximately 0.5 mile north of the Edgewood Road junction and about 0.5 miles south of Sampling Station #5. The Filoli Center is a 654-acre private estate owned and managed by the National Trust for Historic Preservation. The estate includes a Georgian country house, formal gardens, and a nature preserve. Public tours of the country house and formal gardens, and hikes in the nature preserve are available February through October (Filoli Center, 2009).

5.10.1.2 Recreational Trails

Sawyer Camp Trail

The Sawyer Camp Trail is a paved multi-use trail that extends approximately 6 miles between the LCSD vista point near the intersection of Skyline Boulevard and Crystal Springs Road to the south, and Hillcrest Boulevard to the north. The southern portion of trail parallels the eastern shoreline of Lower Crystal Springs Reservoir for approximately 2.6 miles; the northern end of the trail briefly parallels the eastern shore of San Andreas Reservoir before heading northeast towards I-280 and Hillcrest Boulevard. Approximately 300,000 recreationists use the Sawyer Camp Trail each year (San Mateo County, 2009a). The trail is located entirely within the SFPUC Peninsula watershed and the GGNRA Scenic and Recreation Easement and is maintained by the San Mateo County Department of Parks.

The Sawyer Camp Trail is open every day from sunrise to sunset for walking, bicycling, running, roller skating/blading, and horseback riding. The trail is a designated Class I bikeway (described below). Trail features include restrooms, drinking water fountains, benches, picnic tables, and trash receptacles. Parking is available at the LCSD vista point parking lot and along Skyline Boulevard and Crystal Springs Road. The trail is accessible via the vista point parking lot as well as at the southern Sawyer Camp Trail trailhead at the intersection of Skyline Boulevard and Crystal Springs Road (San Mateo County, 2009a).

Fifield-Cahill Ridge Trail / Bay Area Ridge Trail

The Fifield-Cahill Ridge Trail is a 10-mile SFPUC-managed segment of the much larger 550-mile-long Bay Area Ridge Trail.[1] The Fifield-Cahill Ridge Trail runs along Sawyer Ridge on the west side of Lower Crystal Springs and San Andreas Reservoirs. The trail is within the SFPUC Peninsula watershed and the GGNRA Scenic Easement. The trail is a gravel service road extending between the eastern terminus of Sheath Lane to the north, and Skyline Quarry near the intersection of Skyline Boulevard and Highway 92 to the south. In addition to trailheads at Sneath Lane and Skyline Quarry, a third trailhead at the Skylawn Cemetery provides disabled access to a 1.4-mile trail segment that ends at a public restroom area north of the cemetery. At its northern end, the Fifield-Cahill Ridge Trail connects with the GGNRA's trail system and the Sweeney Ridge Trail (SFPUC, 2009b).

Since the Fifield-Cahill Ridge Trail first opened in 2003, the SFPUC has carefully monitored use of the trail by the public to protect watershed lands and water quality. The trail is open to hikers, recreational bicyclists, and equestrians on a reservation-only basis, with groups of up to 20 people led by docents three days a week. Trail amenities are limited to restrooms at 2-mile intervals (SFPUC, 2009b).

Crystal Springs Trail South

The Crystal Springs Trail South, located approximately 1.5 miles south of the LCSD, is an unpaved trail that extends south from the intersection of Highway 92 and Skyline Boulevard on the east side of Crystal Springs Reservoir to Huddart County Park, approximately 3 miles south of Upper Crystal Springs Reservoir. The trail has a total length of 6 miles and parallels Cañada Road for most of its length. The trail is maintained by the San Mateo County Department of Parks. Most of the trail is located on SFPUC Peninsula watershed lands and within the GGNRA's Scenic Easement and Scenic and Recreation Easement.

The Crystal Springs Trail South is open from sunrise to sunset to hikers, joggers, and equestrians and provides access to the Pulgas Water Temple at the southern end of Upper Crystal Springs Reservoir. The Crystal Springs Trail connects to several local and regional trails, including the Ralston, Sheep Camp, and Edgewood Trails (San Mateo County, 2009c).

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[1] The Bay Area Ridge Trail is a planned 550-mile recreational trail circling San Francisco Bay. The Bay Area Ridge Trail is managed through the Bay Area Ridge Trail Council and in partnership with a network of state and regional parks and open space agencies.

Ralston Trail

The Ralston Trail, a designated Class I bikeway (described below), is a 1-mile trail providing access to the Crystal Springs Trail South from the community of Belmont. The Ralston Trail extends west from the Ralston Avenue interchange with Highway 92 in Belmont and over I-280 to Cañada Road and the Crystal Springs Trail South. Bicycling, hiking, and jogging are permitted on the paved trail. The trail is maintained by the San Mateo County Department of Parks (San Mateo County, 2009c). It is located on SFPUC Peninsula watershed lands and within the GGNRA Scenic and Recreation Easement.

Sheep Camp Trail

The Sheep Camp Trail is an unpaved, 1.5-mile trail connecting the Cross Country Running Course in the upper Belmont/San Carlos area with the Crystal Springs Trail South. The trail extends south from Hallmark Avenue in Belmont, beneath I-280 and across Cañada Road to the Crystal Springs Trail South, about 0.5 mile north of the Pulgas Water Temple. The Sheep Camp Trail is managed by the San Mateo County Department of Parks (San Mateo County, 2009c). It is located on SFPUC Peninsula watershed lands and is within the GGNRA Scenic and Recreation Easement.

5.10.1.3 Bicycle Routes

Local and regional roadways in the SFPUC Peninsula watershed are popular routes for independent bicyclists and recreationists. These routes exist within a larger regional network of popular bicycling routes in the surrounding areas, including, but not limited to, abundant popular routes south of the watershed in the Peninsula foothills and Santa Clara County. The City/County Association of Governments (C/CAG) of San Mateo County classifies bicycle routes in the project area as Class I, II, or III facilities.[2] Class I bikeways are designated bike paths with exclusive right-of-way for use by bicyclists or pedestrians. Class II bikeways are bike lanes striped with the paved areas of roadways and established for the preferential use of bicycles, while Class III bikeways are signed bike routes that allow bicycles to share streets or sidewalks with vehicles or pedestrians. Designated Class I, II, and III bikeways in the project area are shown on Figure 5.10-1. The C/CAG of San Mateo County also identifies popular bicycle routes that have not been formally classified by San Mateo County, but that have been identified as popular routes through public surveys and workshops (C/CAG of San Mateo County, 2000).

Skyline Boulevard (Highway 35)

In the project vicinity, Skyline Boulevard (Highway 35) parallels the eastern shoreline of Lower Crystal Springs Reservoir, crosses between Upper and Lower Crystal Spring Reservoirs at Highway 92, and continues southeast along the western shoreline of the upper reservoir to its terminus at Summit Road in the Santa Cruz Mountains. Skyline Boulevard is a popular bicycling route and is a designated Class II bikeway between its junction with Hayne Road and Black Mountain Road to the south, and Trousdale Drive to the north (C/CAG of San Mateo County,

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[2] Bicycle facilities are defined by the State of California in the California Streets and Highway Code, Section 890.4.

2009). Skyline Boulevard was rated as the fourth most popular bicycle route among respondents that were surveyed during preparation of the San Mateo County Comprehensive Bicycle Route Plan (C/CAG of San Mateo County, 2000).

Highway 92 (Half Moon Bay Road/San Mateo Road)

Highway 92 is county-designated scenic route that trends east-to-west between the cities of Hayward and Half Moon Bay. The section of Highway 92 that bisects the Upper and Lower Crystal Springs Reservoirs provides vehicular access to several recreational resources within and beyond the SFPUC Peninsula watershed and is also a popular route for bicycling (C/CAG of San Mateo County, 2000).

Crystal Springs Road

Crystal Springs Road, a windy two-lane road, is one of the primary access routes for recreational bicycling in San Mateo County because it connects to Skyline Boulevard and the Sawyer Camp Trail. Crystal Springs Road is a designated Class II bikeway between Skyline Boulevard and Polhemus Road, and between El Cerrito Avenue and Maple Street. Between Polhemus Road and El Cerrito Avenue it is a Class III bikeway (C/CAG of San Mateo County, 2009). Crystal Springs Road is among the top 20 most popular bicycle routes in the county (C/CAG of San Mateo County, 2000).

Cañada Road

Cañada Road extends south from Highway 92 to Highway 84 in Woodside and is approximately 2 miles south of the LCSD at its closest point. Cañada Road is a designated Class II bikeway (C/CAG of San Mateo County, 2009). A survey conducted for the San Mateo County Comprehensive Bicycle Route Plan indicated that Cañada Road was the most popular bicycle route in the county among respondents (C/CAG of San Mateo County, 2000). The highest volume of bicycle traffic occurs on weekday mornings and weekends. Cañada Road is closed to vehicle traffic on Sundays, which attracts additional bicyclists and other non-motorized recreational activities, including hiking, roller skating/blading, walking, and jogging. “Bicycle Sundays” are sponsored by the San Mateo County Department of Parks. The closed segment of Cañada Road is 7.3 miles long, of which approximately 2 miles parallel the eastern shoreline of Upper Crystal Springs Reservoir (San Mateo County, 2009b). Cañada Road connects to the Ralston and Sheep Camp Trails and the Crystal Springs Trail South (San Mateo County, 2001). Cañada Road is also a county-designated scenic route (San Mateo County, 1986).

Other Designated Bikeways in the Project Area

The only two designated Class I bikeways in the project area are the Sawyer Camp Trail and the Ralston Trail. Both Polhemus Road and Ralston Avenue are designated Class II bikeways (C/CAG of San Mateo County, 2009). Ralston Avenue is also among the top 20 most popular bicycle routes in the county (C/CAG of San Mateo County, 2000).

Tour de Peninsula

In addition to unorganized recreational uses, several sponsored bicycle races use scenic roads within the watershed as part of their route. The most prominent race in the project area is the Tour de Peninsula, which occurs annually in early August. The event consists of three races of varying distances (the 20-mile, 31-mile, and 63-mile courses), all of which begin at Coyote Point Road in the city of San Mateo and utilize portions of Crystal Springs Road, Skyline Boulevard, and Cañada Road in the SFPUC Peninsula watershed (Tour de Peninsula, 2009).

5.10.2 Regulatory Framework

5.10.2.1 Federal Regulations

GGNRA Scenic Easement and Scenic and Recreation Easement

As described in Chapter 4, Plans and Policies, the CCSF granted two easements, a Scenic Easement and a Scenic and Recreation Easement, over the vast majority of the Peninsula watershed to the Department of the Interior, and both easements are administered by the GGNRA. The easements are shown in Section 5.2, Land Use, Figure 5.10-1. The easements govern recreational activities within the Peninsula watershed, subject to the SFPUC's right to construct and conduct ongoing maintenance of its water-utility-related infrastructure.

The GGNRA Scenic Easement, which generally includes all SFPUC land to the west of Crystal Springs Reservoir, restricts public access. Within the Scenic Easement, access to the Fifield-Cahill Ridge Trail (discussed above) is available to the public on a reservation-only basis for guided, docent-led trips. Access to most of the other Scenic Easement areas requires a permit from the SFPUC.

The GGNRA Scenic and Recreation Easement is generally located east of Crystal Springs Reservoir and encompasses watershed lands between the reservoir and I-280. Recreational activities within the Scenic and Recreation Easement include hiking, biking, equestrian use, golfing, running, and bird watching. The San Mateo County Department of Parks manages 25 miles of trails within the easement; the SFPUC carefully monitors trail use by the public to protect local ecosystems and water quality.

5.10.2.2 State Regulations

There are no state regulations governing recreational resources that are applicable to the proposed LCSDI project.

5.10.2.3 Local Regulations

As described in Chapter 4, Plans and Policies, the SFPUC receives intergovernmental immunity from the zoning and building laws of other cities and counties, and relies on its own plans and policies with respect to extraterritorial lands. Therefore, local recreational plans, such as the San Mateo County Trails Plan (San Mateo County, 2001) and San Mateo County Comprehensive

Bicycle Route Plan (C/CAG of San Mateo County, 2000), are not applicable to the proposed project. However, the project's consistency with these plans is evaluated in Chapter 4, Plans and Policies.

SFPUC Peninsula Watershed Management Plan

The SFPUC *Peninsula Watershed Management Plan* (WMP), adopted by the SFPUC in 2002, serves as a long-term regulatory framework for decision-making in the CCSF-owned Peninsula watershed, including the areas surrounding the LCSD and Crystal Springs Reservoir. The Peninsula WMP's primary management goal is to "maintain and improve source water quality to protect public health and safety." Management of recreational resources and public access considerations are secondary goals, which include provisions to continue existing compatible recreational uses and provide opportunities for other compatible uses in the future (SFPUC, 2002).

5.10.3 Impacts and Mitigation Measures

5.10.3.1 Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to recreational resources, but generally considers that implementation of the project would have a significant impact if it were to:

- Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facilities would occur or be accelerated;
- Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment; or
- Physically degrade existing recreational resources.

To evaluate the project's potential to physically degrade recreational resources, this analysis considers whether the LCSDI project would:

- Remove or damage existing recreational resources directly;
- Cause physical environmental effects (such as air quality, noise, traffic, or aesthetic effects) that would indirectly cause deterioration in the quality of the recreational experience; or
- Disrupt access to existing recreational facilities (which could divide a recreational user from some of the established amenities).

Due to the nature of the proposed project, there would be no impacts related to the following criteria; therefore, no impact discussion is provided for these topics for the reasons described below:

Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities Such that Substantial Physical Deterioration of the Facilities Would Occur or be Accelerated. The project would not cause an increase in residents in the area or an increase in the numbers of recreationists in the project area. While project construction could temporarily displace recreationists to other facilities, this relocation would cause a short-term increase in recreational use at alternative facilities during the construction period, which would last up to 14 months. Therefore, the significance criterion related to increased use of existing recreational facilities is not applicable to the project.

Include Recreational Facilities or Require the Construction or Expansion of Recreational Facilities. The project does not propose the construction or expansion of recreational facilities, nor would it result in the need for new or expanded recreational facilities because it would not increase the number of residents or recreationists in the project area. Thus, the significance criterion related to the construction or expansion of recreational facilities is not applicable to the project.

5.10.3.2 Approach to Analysis

Local planning documents and maps were reviewed to identify the recreational resources in the project area that, because of their proximity, could be directly or indirectly affected by the LCSDI project. To determine the potential for construction activities to cause direct effects on recreation, the proposed project's construction areas were compared with the locations of identified recreational resources. Potential indirect effects on recreational resources were identified through the same means, as well as by reviewing the impact findings presented in other pertinent sections of this EIR. Indirect effects that typically result from other environmental impacts and that could adversely affect the recreational experience include: vegetation removal or mortality (Section 5.3, Aesthetics); construction-related traffic hazards along recreational routes or impeded access to recreational resources (Section 5.6, Transportation and Circulation); construction-related noise (Section 5.7, Noise and Vibration); or construction-related dust and exhaust emissions (Section 5.8, Air Quality).

Under CEQA, the lead agency evaluates impacts on existing recreational resources in the context of the availability of similar recreational resources to the public. Physical degradation of a recreational facility (e.g., a bike path or a park) does not automatically result in a finding of a significant recreational impact under CEQA if the public has access to alternative, similar resources. For example, the physical degradation of a single bicycle route might not be significant in a region containing numerous alternative bicycle routes; that is, the resource—recreational bicycling on public roads—would not be significantly diminished by the loss of one route. Accordingly, the following analysis evaluates specific recreational impacts in the context of public availability of similar, alternative recreational resources.

5.10.3.3 Impact Summary

Table 5.10-2 lists the proposed project's recreation impacts and significance determinations.

TABLE 5.10-2
SUMMARY OF IMPACTS – RECREATION

Impact	Significance Determination	
	LCSD Site	**Sampling Station Site**
Impact RE-1: Temporary conflicts with established recreational resources during construction.	SM	LS
Impact RE-2: Conflicts with established recreational uses due to facility siting and project operation.	LS	LS
Impact C-RE: Cumulative effects on recreational resources during construction.	SU	LS

B = Beneficial impact
N/A = Not Applicable or no impact
LS = Less than Significant impact, no mitigation required
SM = Significant impact, can be Mitigated to less than significant
PSM = Potentially Significant impact, can be Mitigated to less than significant
SU = Significant Unavoidable impact
PSU = Potentially Significant Unavoidable impact

5.10.3.4 Construction Impacts

Impact RE-1: Temporary conflicts with established recreational resources during construction.

Construction activities would result in temporary, direct impacts on established recreational resources if construction activities were to overlap geographically with existing recreational facilities or trails, or if construction activities were to temporarily disrupt access to or use of recreational facilities in the project area. In addition, temporary indirect impacts on recreational resources would result from construction-related noise, dust and exhaust emissions, visual disruption, and traffic disruption or traffic hazards occurring at or in proximity to recreational resources. The significance of such impacts varies with the degree to which the effect on recreational uses constitutes a significant impact to the overall recreational resource.

Potential noise, air quality, aesthetics, and traffic and access impacts of the project are evaluated in detail in the corresponding impact sections in Chapter 5, Environmental Setting, Impacts, and Mitigation Measures (Sections 5.7, 5.8, 5.3, and 5.6, respectively). The following paragraphs summarize these impacts of the project in relation to their indirect impacts on recreational resources as well as the potential for direct impacts on recreational facilities. Next, the analysis considers the combined impact on recreation due to these potential direct and indirect effects, and evaluates them in the context of the overall impact on the recreational resource.

Lower Crystal Springs Dam Vicinity

Temporary Closure of the LCSD Vista Point. During construction, the LCSD vista point and parking lot (Staging Area 5) would be closed, and public access to the vista point would be prohibited. Although construction activities would temporarily inhibit public views of Crystal

Springs Reservoir from the designated LCSD vista point, comparable views of the watershed would remain accessible throughout project construction, including multiple views from similar vantage points along the Sawyer Camp Trail. Numerous alternative viewing locations of Crystal Springs Reservoir throughout the watershed would continue to exist during the temporary closure of the LCSD vista point.

Reduced Parking and Vehicle Access for Recreationists. As described in detail in Section 5.6, Transportation and Circulation, access to recreational facilities would be temporarily impeded during construction due to the closure of the LCSD vista point and an approximately 1,300-foot section of Skyline Boulevard between Crystal Springs Road and Bunker Hill Drive. Construction staging areas would be located at (1) the LCSD vista point (Staging Area 5), which provides parking and access to the viewing area; (2) along the shoulder of Skyline Boulevard near the Crystal Springs Road junction (Staging Areas 6 and 7), which currently provides parking and access to the southern entrance to Sawyer Camp Trail; and (3) along the shoulder of Skyline Boulevard for approximately 1,000 feet south of the LCSD (Staging Area 8). Construction worker vehicles would further reduce parking, but roadside parking close to the southern Sawyer Camp Trail trailhead would remain available to the public along Skyline Boulevard and Crystal Springs Road, immediately north and east of the LCSD vista point, respectively.

In addition, Skyline Boulevard is the primary access route to the Sawyer Camp Trail from areas south of the LCSD. Project implementation would result in the closure of a 1,300-foot section of Skyline Boulevard between Crystal Springs Road and Bunker Hill Drive for the duration of construction activities, which would be closed up to 14 months during construction of the LCSDI project. (When combined with construction activities associated with San Mateo County's Crystal Springs Dam Bridge Replacement project, a section of Skyline Boulevard in the vicinity of the LCSD would be closed for approximately 32 months [San Mateo County, 2009d], as described in detail below under Section 5.10.3.7, Cumulative Impacts.) As a result, vehicle access to the Sawyer Camp Trail from areas south of the LCSD would be temporarily impeded during construction. Vehicle access to the southern Sawyer Camp Trail trailhead would be restricted to Crystal Springs Road and Skyline Boulevard north of the LCSD.

Impeded Access to Popular Bicycle Routes. Skyline Boulevard is a popular bicycle route and is a designated Class II bikeway between the Hayne Road/Black Mountain Road junction to the south, and Trousdale Drive to the north. The section of Skyline Boulevard that would be closed during construction activities is located approximately 1 mile south of the Class II bikeway segment and connects to other popular bicycle routes and designated bikeways, including Highway 92 and Cañada Road. As stated in Section 5.6, Transportation and Circulation, recreational bicyclists could elect to use alternative bicycle routes in the region during the construction period. Bicyclists may choose to divert to other Peninsula roadways and bicycle routes to avoid the closed section of Skyline Boulevard (e.g., Crystal Springs Road, Polhemus Road, and Bunker Hill Drive). Southbound bicycle traffic on Skyline Boulevard or the Sawyer Camp Trail would be directed east onto Crystal Springs Road, south onto Polhemus Road, and west onto either Bunker Hill Drive or the Ralston Trail. Bicyclists coming from south of the LCSD could continue north on Skyline Boulevard to Bunker Hill Drive and then head east on Bunker

Hill Drive to Polhemus Road, which connects to Crystal Springs Road. Alternately, bicyclists coming from south of the LCSD could bypass the closed section of Skyline Boulevard while also avoiding Bunker Hill Drive, which may be too steep for some bicyclists, by connecting to the Ralston Trail near the northern terminus of Cañada Road, heading northeast to Polhemus Drive, and then heading west on Polhemus Drive to Crystal Springs Road. Bicycle detour routes are depicted in Figure 5.6-2 in Section 5.6, Transportation and Circulation.

The proposed project could also interfere with sponsored bicycle races, such as the annual Tour de Peninsula, which utilize Skyline Boulevard and Crystal Springs Road as part of their routes. Project construction is estimated to occur for up to 14 months, from February 2011 to March 2012, which would coincide with the typical spring and summer bicycle racing seasons.

Indirect Effects of Construction-Related Noise. As described in detail in Section 5.7, Noise and Vibration, operation of construction equipment would generate noise for about 9 months (and up to 14 months) that could affect the experience of persons recreating in the vicinity of LSCD, including bicyclists, equestrians, and other recreationists along the southern 750-foot segment of the Sawyer Camp Trail. North of this 750-foot section, the Sawyer Camp Trail turns eastward, at which point construction noise would be substantially attenuated by the intervening topography. Thus, from this point northward, construction noise effects on the remainder of the Sawyer Camp Trail would be minimal. Although located at the southern access point to the trail, the affected 750 feet of trail make up a very small piece of the 6-mile long trail. The trail can also be accessed from the north. No other recreational trails are located within 1,000 feet of the construction work area, and thus no other trails would be affected by construction noise. With regard to bicyclists, construction noise impacts would be fleeting due to the relatively rapid movement of bicyclists through the project vicinity.

Indirect Effects of Construction-Related Dust and Exhaust Emissions. As described in detail in Section 5.8, Air Quality, construction activities would generate fugitive dust, particularly during site preparation, grading, and earthwork. Construction equipment and vehicles near the LCSD site would also generate exhaust emissions. The combined effects of construction-related air emissions could physically degrade nearby recreational resources by deteriorating the quality of the outdoor experience, particularly at the southern end of the Sawyer Camp Trail. Recreationists such as cyclists, equestrians, and hikers, however, would have only transient exposure to emissions from the construction site while passing through the area.

Deterioration of the Recreational Experience due to Views of Construction Sites and Activities. As described in detail in Section 5.3, Aesthetics, the vista point and a portion of Skyline Boulevard would be closed during construction activities, and views from these locations would be temporarily eliminated from public access. However, construction activities at the top of the dam could be visible to recreationists using the Sawyer Camp Trail. Southeast-facing views of the dam can be seen from this trail within a distance of approximately 0.25 mile. Views of the dam along the southernmost 400 feet of the trail are blocked by intervening topography. Although distant and temporary, views of Staging Area 8 could also be seen from Sawyer Camp Trail. Views of construction activities and staging near the top of the dam could possibly deteriorate the quality of the recreational experience. However, similar recreational resources are available throughout the Peninsula watershed. In addition, views of the construction zone would be relatively distant and project construction and staging activities would be temporary, lasting about 9 months (and up to 14 months maximum).

Effects of Increased Traffic and Traffic Safety Hazards on Recreation. Project construction would include access and haul routes for construction vehicles, including trucks for delivery of construction materials and removal of construction debris, which would increase traffic on existing roads in the project vicinity during the 14-month construction period (with the most intense construction traffic occurring for 9 months). Haul routes to the LCSD site include I-280, Highway 92, Hayne Road, Bunker Hill Drive, Skyline Boulevard, Polhemus Road, and Crystal Springs Road.

Increased construction traffic on Skyline Boulevard and Crystal Springs Road would affect the recreational experience at recreational facilities adjacent to these roadways, including the Sawyer Camp Trail. Because the Sawyer Camp Trail is a paved off-road path, recreational users expect less traffic, less noise, and a higher degree of safety. Construction traffic would increase construction-related noise and air emissions as well as safety risks compared to existing conditions. As described in Section 5.6, Transportation and Circulation, construction activities temporarily suspend the normal functions of roadways, and the potential exists for an increase in traffic safety hazards during project construction. This increase in safety hazards would be due to the increased potential for conflicts between construction vehicles (which have slower speeds and wider turning radii than autos) and autos, bicyclists, and pedestrians using the roadways, as well as confusion on the part of bicyclists and pedestrians due to temporary alterations in bicycle and pedestrian circulation.

In addition, a portion of Highway 92, which provides bicycling opportunities and access to the Fifield-Cahill Ridge Trail, would be used to haul construction debris to the Ox Mountain Landfill, which is located west of the reservoir. The use of the road for hauling would not impede recreational use; however, it would result in temporary safety hazards and increased traffic during construction.

Conclusions. As described above, project construction would result in temporary, adverse impacts on established recreational uses in the project area due to the combined effects of: closure of the LCSD vista point; reduced parking availability; impeded vehicular access to recreational facilities; impeded access to popular bicycle routes; noise disturbance from construction equipment and vehicles; dust and exhaust emissions from construction activities and vehicles; deteriorated views of LCSD; and increased traffic safety hazards. These effects would be contrary to the expectations of recreational pedestrians, bicyclists, equestrians, and other recreational users in the project vicinity. Combined, these effects would temporarily affect recreational facilities by deteriorating the quality of the recreational experience for (1) recreationists at the southernmost end of Sawyer Camp Trail and (2) bicyclists using bicycle routes in the vicinity of LCSD.

Although the area contains numerous alternative hiking and recreational trails, limited access and reduced parking at the southern end of the Sawyer Camp Trail would result in a substantial disruption to the overall recreational resource because of the trail's intense public use (300,000 users per year) and its relatively unique character as a wide, paved trail. The indirect noise and air quality impacts to the recreational experience on the Sawyer Camp Trail would combine to exacerbate the overall impact on this recreational resource, although these impacts would be limited in duration and would primarily affect the southernmost portion of the trail. Implementation of Mitigation Measures M-TR-1 (Traffic Control Plan); M-NO-1 (Administrative and Source Controls); M-AQ-1a (Dust Control Measures); M-AQ-1b (Exhaust Control Measures); and M-AQ-1c (Additional Exhaust Control Measures) would address the proposed project's construction-related impacts to this recreational resource. Mitigation Measure M-TR-1, described in Section 5.6, Transportation and Circulation, would mitigate access and parking issues with traffic detour signs as well as temporary signage at the vista point and trailhead to notify recreationists of alternative parking areas that would remain available during project construction activities. Thus, assuming implementation of the identified mitigation measures for indirect impacts associated with traffic, noise and air quality, temporary construction-related impacts on the Sawyer Camp Trail as a recreational resource are *less than significant*, and no additional mitigation is required.

With regard to bicycling, the above analysis indicates that the proposed project would have indirect, combined impacts associated with traffic, safety hazards, noise, and air quality during project construction activities that would result in deterioration of the bicycling experience in the LSCD vicinity. In addition, recreational bicycling would be directly affected by the closure of a 1,300-foot section of Skyline Boulevard during project construction activities. Implementation of Mitigation Measures M-TR-1 (Traffic Control Plan); M-NO-1 (Administrative and Source Controls); M-AQ-1a (Dust Control Measures); M-AQ-1b (Exhaust Control Measures); and M-AQ-1c (Additional Exhaust Control Measures) would address these construction-related, indirect impacts. Mitigation Measure M-TR-1 would require the SFPUC to coordinate with San Mateo County on bicycle detour routes to reduce impacts resulting from the temporary closure of Skyline Boulevard and would provide signage to notify recreationists of alternate access routes to minimize bicycle access issues throughout the construction period. Mitigation Measure M-TR-1 would also include roadside safety protocols such as advance "Road Work Ahead" warning signs and speed control to reduce traffic hazards during construction.

However, the deterioration of the bicycling experience in the LSCD vicinity, as well as impeded access to popular bicycle routes due to the temporary closure of Skyline Boulevard, occurs against a backdrop of numerous, popular bicycling alternatives in the surrounding area. Nonetheless, because of the high volume of bicycle users along Skyline Boulevard and the Sawyer Camp Trail, this EIR conservatively considers the localized impacts to bicycling as a degradation of a recreational resource and a *significant* impact. However, the proposed project's impacts on recreational bicycling would be reduced to a less-than-significant level through implementation of Mitigation Measure M-RE-1 (Notify Bicycle Organizations of Detours). Mitigation Measure M-RE-1 would augment Mitigation Measure M-TR-1 by requiring that the SFPUC work with San Mateo County to notify local bicycle organizations of the construction activities and bicycle detour routes.

The potential conflicts with recreational bicycling associated with the use of Highway 92 as a haul route are addressed in Sections 5.6, Transportation and Circulation. Implementation of Mitigation Measure M-TR-1 (Traffic Control Plan), which would limit the hauling of excavated materials to weekdays, would address potential conflicts with bicyclists along haul routes. Thus, impacts on recreational bicycling due to the use of Highway 92 as a haul route would be *less than significant*, and no additional mitigation is required.

Sampling Station #5 Vicinity

Recreational resources in the vicinity of Sampling Station #5 include the Pulgas Water Temple, Crystal Springs Trail South, and designated Class II bikeways along Cañada Road and Edgewood Road. Although the Crystal Springs Trail South provides access to the Pulgas Water Temple, this nearby trail segment parallels the west shoulder of Cañada Road and would not be affected by construction activities at the Sampling Station #5 site. Construction activities and staging associated with raising Sampling Station #5 would occur in an off-street area immediately west of the Pulgas Water Temple. This area is not publicly accessible and is barely visible to the public because it is screened from view by trees and landscaping. The duration of construction at this site is four months, and the work would be conducted during weekday, daytime shifts only. As discussed in Section 5.7, Noise and Vibration, construction activities at the Sampling Station #5 and staging area would result in increased construction-related noise levels that could periodically interfere with speech and could disrupt recreational uses at the Pulgas Water Temple. However, increased noise levels would be intermittent and would be limited to the four-month construction period.

Indirect impacts on recreational uses in the vicinity of Sampling Station #5 from increased air emissions during construction activities would be like those described above for the LCSD site. Construction activities would generate fugitive dust and exhaust emissions that could adversely affect the recreational experience. Implementation of Mitigation Measures M-AQ-1a (Dust Control Measures), M-AQ-1b (Exhaust Control Measures), and M-AQ-1c (Additional Exhaust Control Measures) would address the temporary increases in air emissions on recreational uses by requiring construction practices that limit fugitive dust and exhaust emissions during construction activities. In addition, implementation of Mitigation Measure M-LU-1b (Event Scheduling at Pulgas Water Temple) would require that the SFPUC restrict weddings and other special events during the construction period to ensure these events are not adversely affected by project construction activities. See Impact LU-1 in Section 5.2, Land Use, for additional discussion of potential impacts on special events during construction. With implementation of these mitigation measures, potential impacts on recreational uses at the Pulgas Water Temple would be *less than significant*, and no additional mitigation is necessary.

The primary roadways serving the Sampling Station #5 site include Cañada Road, Edgewood Road, and I-280. Construction activities would not involve construction within the right-of-way of Cañada Road, and therefore would not result in any temporary lane closures on this road. As discussed in Section 5.6, Transportation and Circulation, construction-related increases in traffic volumes on roadways serving the Sampling Station #5 site, including vehicular traffic diverted from Skyline Boulevard due to the temporary closure of this road in the vicinity of the LCSD, represent less than 1 percent of existing traffic volumes. The increased vehicle traffic on roadways serving the Sampling Station #5 site could be accommodated by the existing roadway network and thus would not significantly increase traffic volumes or physically degrade bicycle routes. Access to the Pulgas Water Temple and parking lot would not be impeded, and the construction-related increase in traffic volumes is not expected to result in substantial traffic hazards for bicyclists and other recreationists on Cañada Road and Edgewood Road. Consequently, temporary impacts on recreational bicycling in the vicinity of Sampling Station #5 related to construction traffic and impeded access to recreational facilities would be *less than significant*, and no mitigation is required.

5.10.3.5 Operational Impacts

Impact RE-2: Conflicts with established recreational uses due to facility siting and project operation.

Lower Crystal Springs Dam Vicinity

As described in Chapter 3, Project Description, Section 3.7.2, the post-construction operations of Crystal Springs Reservoir would be similar to current operations, except that the average annual water storage and average annual water surface elevation would both increase. The average annual water surface water elevation would increase to 281.8 feet, 6.6 feet higher than under current conditions; the maximum normal water surface elevation would increase by 4 feet, to 287.8 feet. There are no established recreational facilities or uses in areas that would be inundated or lost as a result of the future increase in reservoir levels. However, the higher water surface elevations would inundate the existing shoreline vegetation around the perimeter of the reservoir, resulting in linear patches of dead trees along the shoreline that would be noticeable from designated recreational trails and bicycle routes. These patches of dead trees along the shoreline of the Upper and Lower Crystal Springs Reservoirs would be visible to recreationists from certain vantage points along the Sawyer Camp Trail, Skyline Boulevard, the Highway 92 causeway, and Cañada Road (see Impact AE-4 in Section 5.3, Aesthetics, for additional discussion). The presence of dead or dying trees along the edge of the reservoir could indirectly affect the quality of the recreational experience at some locations in the watershed. Implementation of Mitigation Measure M-AE-4 (Tree Removal Plan) would address the potential indirect aesthetics effects on recreational uses to the extent feasible. Aside from indirect aesthetic impacts associated with dying vegetation along the edge of the reservoir, project operations would have no direct effect on the public's ability to access and utilize recreational resources. Future project operations would not result in increased noise levels, air emissions, or traffic congestion or traffic hazards compared to existing conditions. Thus, the project's operational impact on recreational resources would be *less than significant*, and no additional mitigation is required.

Sampling Station #5 Vicinity

The project would increase the inundation frequency of a portion of watershed land at the south end of Upper Crystal Springs Reservoir; this area is located west of publicly accessible portions of the Pulgas Water Temple, but the temple, reflecting pool, parking lot, grounds, and other public areas would not be affected. Cañada Road, a designated Class II bikeway, is the only recreational resource in the vicinity of Sampling Station #5 that would be potentially affected by indirect impacts on visual aesthetics associated with future reservoir operations and the associated increases in water surface elevations. However, this indirect impact would be addressed by implementation of Mitigation Measure M-AE-4 (Tree Removal Plan). Thus, the project's operational impact on recreational resources would be *less than significant*, and no additional mitigation is required.

5.10.3.6 Mitigation Measures

Mitigation Measure M-RE-1: Notify Bicycle Organizations of Detours.

Prior to construction, the SFPUC shall actively work with San Mateo County, C/CAG of San Mateo County, and other local agencies to identify bicycle organizations (such as the Western Wheelers Bike Club, Bay Area Bicycle Coalition, and the Silicon Valley Bike Coalition) and to notify them of the construction activities and bicycle detour routes. This shall include notifications to organizations sponsoring bicycle events or races in the Peninsula region. In addition to providing information along the bicycle detour routes, the SFPUC shall also provide information to bicyclists regarding alternative bicycle routes in the area, either through printed brochures and/or on websites.

5.10.3.7 Cumulative Impacts

Impact C-RE: Cumulative effects on recreational resources during construction.

The geographic scope of potential cumulative, construction-related recreation impacts encompasses the construction and staging sites at the LCSD and Sampling Station #5, and recreational facilities, trails, and bicycle routes in their immediate vicinities.

Construction Projects in Lower Crystal Springs Dam Vicinity

During the 14-month construction period, implementation of the LCSDI project would result in direct impacts to established recreational uses in the project area by impeding access to nearby recreational facilities, and closing a designated vista point and a portion of a popular bicycle route (Skyline Boulevard). Indirect construction-related impacts to established recreational uses would also result from increased noise levels, air emissions, and traffic hazards. Construction of many of the projects listed in Table 5.1-1 would have similar noise, traffic, and air quality impacts during construction that could affect the quality of the recreational experience at nearby facilities. Six cumulative projects would be located adjacent to or near the LCSD site, and in combination with the LCSDI project, could result in cumulative impacts on recreational resources. The cumulative projects could either coincide in time or extend the construction duration in the same area and include: San Mateo County's Crystal Springs Dam Bridge Replacement project, SFPUC's Crystal Springs/San Andreas (CSSA) Transmission Upgrade project, PG&E's Jefferson-Martin Transmission Line project, SFPUC's Crystal Springs Pipeline No. 2 (CSPL2) Replacement project, SFPUC's New Crystal Springs Bypass Tunnel (NCSBT) project, and SFPUC's Habitat Reserve Program (HRP). The potential overlap among project schedules and potential cumulative impacts are described below. As indicated in Table 5.1-1, the combined construction duration of the cumulative projects in the vicinity of the LCSDI project would occur over a four-year period between 2010 and 2014. Together, the LCSDI and the Crystal Springs Dam Bridge Replacement projects would require temporary closure of a segment of Skyline Boulevard between Crystal Springs Road and Bunker Hill Road to through traffic for approximately 32 months. Drivers and bicyclists would be expected to utilize detours to access their destinations for the duration of the closure. The Crystal Springs Dam Bridge Replacement project would require 6 months to demolish the bridge structure prior to construction of the LCSDI project, and 12 months to replace the bridge following completion of the 14-month LCSDI project construction. Recreational bicycling along Skyline Boulevard, a popular bicycle route connecting to designated Class I, II, and III bikeways as well as other popular bicycle routes, would be impeded throughout this period. In addition, the duration of construction-related traffic, air, and noise impacts on recreation resources in this area would be prolonged when considering the cumulative effects of these multiple projects in the LCSD vicinity. The vista point parking lot would likely be closed for an extended period of time to the extent that other projects (i.e., Crystal Springs Dam Bridge Replacement project and CSSA Transmission Upgrade project) could also use this lot for construction staging.

Between 2010 and 2013, the CSSA Transmission Upgrade project would involve construction of transmission and pump station improvements adjacent to the LCSD and along Skyline Boulevard. The CSSA Transmission Upgrade project would use staging areas and construction routes along Skyline Boulevard and Highway 92, similar to the LCSDI project. The PG&E Jefferson-Martin Transmission Line permanent installation would be completed concurrently with the Crystal Springs Dam Bridge Replacement project (following completion of LCSDI) and would not prolong cumulative construction-related impacts.

Between mid-2011 and late 2012, the CSPL2 Replacement project would require closure of one of the two travel lanes on Crystal Springs Road for 30 days, necessitating alternate one-way traffic operations. Because Crystal Springs Road would be used as part of the bicycle detour route under Mitigation Measures M-TR-1 (Traffic Control Plan) for the LCSDI project, concurrent construction of these projects could affect bicycle detours. The cumulative effect of the LCSDI project in conjunction with the CSPL2 Replacement project would increase construction-related traffic (including traffic safety), noise, and air quality effects on recreational opportunities in the vicinity (Skyline Boulevard and Crystal Springs Road), potentially affecting recreational bicyclists along these roadways.

Between 2010 and 2013, the HRP would have construction-related impacts on access roads in the vicinity of the LCSD. In addition, construction vehicles must cross Sawyer Camp Trail to access several of the individual HRP project sites. The cumulative effect of the LCSDI project in conjunction with these various HRP projects would increase construction-related traffic, noise, and air quality effects on recreation opportunities in the vicinity, increase interruptions of Sawyer Camp Trail, and prolong the duration of construction activities in the area, affecting and deteriorating the overall quality of the recreational experience.

Construction at the LCSD site is currently scheduled to occur before the start of the CSPL2 Replacement project and is projected to overlap or be continuous with the Crystal Springs Dam Bridge Replacement project, the CSSA Transmission Upgrade project, the PG&E Jefferson-Martin Transmission Line, and various HRP projects. However, if the schedule for the LCSDI project were to be delayed, construction activities for the CSPL2 Replacement project would also overlap with the LCSDI. Overlapping construction activities would result in increased traffic volumes, particularly truck traffic, along Crystal Springs Road and other local roadways. The increased traffic volumes, detours, and lane restrictions associated with the overlapping projects would increase potential traffic hazards for bicycles on Crystal Springs Road and Skyline Boulevard, and would further degrade the quality of the recreational experience of bicyclists using these routes. However, recreational bicyclists could elect to use alternate bicycle routes in the area.

As described above, the recreational resources or opportunities that would be cumulatively affected by the construction of the cumulative projects are:

- Sawyer Camp Trail would be affected by the LCSDI project in combination with the CSSA Transmission Upgrade project; Crystal Springs Dam Bridge Replacement project; various HRP projects; and PG&E Jefferson-Martin Transmission Line.
- Recreational uses along roadways in the vicinity of the LSCD, particularly bicycling, would be affected by the LCSDI project in combination with the CSSA Transmission Upgrade project; Crystal Springs Dam Bridge Replacement project; various HRP projects; PG&E Jefferson-Martin Transmission Line project; CSPL2 Replacement project; and NCSBT project.

The combined impacts of the cumulative projects on these recreational resources would represent potentially significant cumulative impacts.[3]

The LCSDI project's contribution to these cumulative impacts recreational resources would be substantially reduced through implementation of Mitigation Measures M-TR-1 (Traffic Control Plan); M-NO-1 (Administrative and Source Controls); M-AQ-1a (Dust Control Measures); M-AQ-1b (Exhaust Control Measures); M-AQ-1c (Additional Exhaust Control Measures); and M-RE-1 (Notify Bicycle Organizations of Detours), as described in the discussion of Impact RE-1, above. Implementation of Mitigation Measure M-TR-1 would establish bicycle detour to reduce impacts resulting from the temporary closure of Skyline Boulevard and would provide signage to notify recreationists of alternate access routes to minimize bicycle access issues throughout the LCSDI construction period. Mitigation Measure M-TR-1 would also include roadside safety protocols such as advance "Road Work Ahead" warning signs and speed control to reduce traffic hazards during LCSDI construction. Mitigation Measure M-RE-1 would augment Mitigation Measure M-TR-1 by requiring that the SFPUC work with San Mateo County to notify local bicycle organizations of the LCSDI construction activities and bicycle detour routes. However, even with implementation of these mitigation measures, the LCSDI's contribution to the cumulative impacts on recreational resources would be cumulatively considerable (*significant*) due to the extent and duration of the residual impacts on these resources. Recreationists using Sawyer Camp Trail would still be noticeably affected by construction activities, and bicyclists accustomed to using roadways in the project vicinity would be subjected to continuous and prolonged disruption and forced to either use detours or relocate to other bicycle routes during the construction period.

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[3] For purposes of this cumulative impact analysis, this EIR conservatively considers Sawyer Camp Trail and local recreational use of roadways (bicycles, pedestrians) as recreational resources under CEQA, nothwithstanding availability of alternative recreational opportunities. See related discussion above at Impact RE-1.

The proposed project's contribution to significant cumulative recreational impacts would be further reduced by Mitigation Measure M-C-TR, Coordinated Peninsula Regional Transportation Management Plan, described in Section 5.6, Transportation and Circulation. The Coordinated Peninsula Regional Transportation Management Plan would include bicycle detour plans, provisions for parking for recreational access near Sawyer Camp Trail, and a public information outreach program to notify nearby residents and recreational users of the Skyline Boulevard/ Crystal Springs Road area of construction activities. In addition, implementation of Mitigation Measure M-C-RE (Coordinate Trail Access for Sawyer Camp Trail during Construction) would require the SFPUC to coordinate impacts on access to and parking for the Sawyer Camp Trail due to the proposed project, the Crystal Springs San Andreas Transmission Upgrade project, and the Crystal Springs Dam Bridge Removal Project.

The foregoing mitigation measures would substantially reduce the proposed project's contribution to potential cumulative recreational impacts. However, the project's contribution to the cumulative impact on the recreational experience would remain cumulatively considerable and thus *significant and unavoidable* due to the cumulative duration of the impacts to Skyline Boulevard in combination with the Crystal Springs Dam Bridge Removal project (approximately 32 months), including extended detours and vehicle conflicts with other construction projects.

Construction Projects in Sampling Station #5 Vicinity

The proposed project would overlap with construction of three projects in the vicinity of Sampling Station #5. These include the Pulgas Discharge Channel Modifications project, the Pulgas Structural Rehabilitation and Roof Replacement project, and the Pulgas Modification of Existing Dechloramination Facility project. While construction at the Sampling Station #5 site in combination with construction of these other three projects could result in cumulative construction-related impacts to recreational resources in the vicinity of the Pulgas Water Temple, with implementation of Mitigation Measures M-AQ-1a (Dust Control Measures), M-AQ-1b (Exhaust Control Measures), M-AQ-1c (Additional Exhaust Control Measures), and M-LU-1b (Event Scheduling at Pulgas Water Temple), the project's contribution to the cumulative impact would not be cumulatively considerable (*less than significant*).

In addition, since construction at the Sampling Station #5 site would not involve road closures or detours, and would only occur for a four-month period, the project's contribution to cumulative impacts on bicycle routes, traffic hazards for bicyclists and other recreationists on Cañada Road and Edgewood, would not be cumulatively considerable and would be *less than significant*. No mitigation is required.

5.10.3.8 Cumulative Mitigation Measures

Mitigation Measure M-C-RE: Coordinate Trail Access for Sawyer Camp Trail during Construction.

The SFPUC shall coordinate measures to reduce impacts associated with access to and parking for the Sawyer Camp Trail from the proposed project and the CSSA Transmission Upgrade project, and shall coordinate with San Mateo County for measures to reduce impacts from the proposed project and the Crystal Springs Dam Bridge Replacement project. The purpose of the coordination is to minimize the durations of trail closure, maximize trail access, and provide information to trail users about alternative locations and access. The SFPUC shall post notices of temporary trail closures and/or disruptions at the trailheads and on SFPUC's website during the construction of the LCSDI and CSSA Transmission Upgrade projects, and shall coordinate with San Mateo County for posting notices during construction of the Crystal Springs Dam Bridge Replacement projects. The SFPUC website shall include information for alternate locations and access to other comparable trails for recreationalists to use during temporary closures.

5.10.4 References

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5.11 Utilities and Service Systems

This section addresses potential impacts on utilities and service systems that could occur with implementation of the Lower Crystal Springs Dam Improvements (LCSDI) project. Utilities discussed in this section include potable water, stormwater drainage, wastewater, natural gas, electricity, and telecommunications. This section also evaluates potential impacts associated with solid waste generated by demolition, excavation, and construction activities. Impacts on public services and governmental facilities are discussed in Section 5.1.1, Scope of Analysis. Impacts related to parks and recreational facilities are discussed in Section 5.10, Recreation.

5.11.1 Setting

The utilities and service systems potentially affected by the project, which include those within the project footprint and in the immediate vicinity, are discussed below. Also addressed are solid waste disposal facilities within the greater San Francisco Bay Area that could be used for disposal of construction-related waste and debris.

5.11.1.1 Utilities

Electricity, Natural Gas, and Telecommunications

Pacific Gas and Electric Company (PG&E) provides natural gas and electricity throughout the LCSDI project area. PG&E completed construction of the 27-mile-long, 230-kilovolt (kV) Jefferson-Martin Transmission Line through San Mateo County in August 2006, including a primarily underground segment along the eastern side of Crystal Springs Reservoir. As part of the Jefferson-Martin Transmission Line project, PG&E installed two temporary transmission towers and overhead lines on the eastern side of the Skyline Boulevard Bridge and Lower Crystal Springs Dam (LCSD). In coordination with San Mateo County's Crystal Springs Dam Bridge Replacement project, PG&E intends to replace this line segment by running a new line through electrical conduits in the replacement bridge structure (refer to Section 5.1.4, Projects Considered in the Cumulative Analysis, for more detail). There are also overhead power lines east of the Crystal Springs Pump Station along Crystal Springs Road. A PG&E substation is located west of the Crystal Springs Pump Station along the adjacent gravel access road.

Telephone service to customers in the project area is provided by AT&T. A variety of private companies provide cell phone, DSL internet, and cable television services in the project vicinity. A number of cellular telephone antennas and facilities are located along the I-280 corridor. However, no telephone or other communication lines or facilities are present within the project footprint.

Water Service

As shown in Chapter 2, Figure 2-3, the SFPUC provides wholesale water supplies to cities and towns in the project vicinity, including the communities directly east of Crystal Springs Reservoir. Within the project construction areas at the top and toe of the dam and at water quality Sampling Station #5, there are no water distribution lines with turnouts directly to customers.

Drainage Infrastructure

At the southern abutment of the LCSD is a 30-inch stormwater drainage pipe owned by the California Department of Transportation (Caltrans); this pipe collects runoff from I-280 and discharges to the existing stilling basin at the base of the dam. Stormwater runoff from the Skyline Boulevard Bridge occurs as sheetflow that flows to the eastern edge of the bridge, onto the downward face of the dam, and then into the stilling basin and lower San Mateo Creek.

A 60-inch steel pipe daylights next to the San Mateo Creek channel below the dam in the vicinity of the Crystal Springs Pump Station near Pool 1. This pipe is part of the SFPUC's water infrastructure and is designed to allow for emergency discharges from Crystal Springs Reservoir to San Mateo Creek when the rapid lowering of reservoir levels is required. It also discharges leakage from the Crystal Springs Pump Station into lower San Mateo Creek (see Section 5.15, Hydrology and Water Quality, for further discussion).

Wastewater

The San Mateo County Department of Public Works provides sanitary sewer collection services for residents and businesses in ten sanitary sewer districts throughout the county. The county does not operate sewage treatment facilities; sewage that flows from the collection systems in the individual sanitary sewer districts is conveyed to sewage treatment plants operated by the South Bayside System Authority, or by the Cities of Burlingame or San Mateo (San Mateo County Department of Public Works, 2009). The sanitary sewer collection lines that exist within the project footprint serve the Crystal Springs Pump Station.

5.11.1.2 Other Facilities

Other facilities within the project footprint include a hydraulic monitoring station on the north dam abutment that is owned and operated by the U.S. Geological Survey (USGS), and several seismographs situated on the dam that are owned by the California Geological Society (CGS). Both the USGS and the CGS hold permits issued by the SFPUC to utilize these facilities at the LCSD.

5.11.1.3 Solid Waste

Allied Waste Services provides solid waste disposal and recycling collection services to the communities of Atherton, Belmont, Burlingame, Hillsborough, San Mateo, Foster City, Redwood City, San Carlos, and Fair Oaks, as well as to unincorporated areas of San Mateo County (Allied Waste Services, 2009). Ox Mountain Sanitary Landfill, which is owned by Allied Waste Industries, Inc., is the only operating landfill in San Mateo County. The Ox Mountain Sanitary Landfill has a permitted maximum disposal capacity of 3,598 tons per day and an estimated permitted capacity of 37,900,000 cubic yards. As of 2000, an estimated 6,746,148 cubic yards had been used, which amounts to 18 percent of the landfill capacity. The landfill is scheduled to close in 2018 (CIWMB, 2009a).

Nearby solid waste transfer facilities include the San Bruno Transfer Station (permitted maximum daily disposal of 120 tons), Blueline Transfer Station (maximum of 1,200 tons per day), and Mussel

Rock Transfer Station (maximum of 500 tons per day) (CIWMB, 2009b; 2009c; 2009d). Hazardous wastes are disposed of at the Kettleman Hills Hazardous Waste Facility, a 1,600-acre chemical waste disposal and treatment facility located 55 miles southwest of Fresno. Of these 1,600 acres, 499 acres have been approved to receive solid, semi-solid, and liquid hazardous and extremely hazardous wastes. This portion of the landfill has a remaining capacity of 7,300,000 cubic yards (DTSC, 2003).

5.11.2 Regulatory Framework

5.11.2.1 Federal Regulations

No federal regulations related to public utilities and service systems are applicable to the proposed project.

5.11.2.2 State Regulations

California Public Utilities Commission

The California Constitution vests the California Public Utilities Commission (CPUC) with exclusive power and sole authority to regulate privately owned and investor-owned utilities. The CPUC's exclusive power extends to all aspects of utility regulation, including facility location, design, construction, maintenance, and operation. The CPUC requires regulated utilities to work closely with local governments and to give due consideration to their concerns. The CPUC does not regulate publicly owned utilities such as the SFPUC.

California Integrated Waste Management Act of 1989

The California Integrated Waste Management Act (CIWMA) of 1989 (Public Resources Code [PRC], Division 30), enacted through Assembly Bill (AB) 939 and modified by subsequent legislation, required all California cities and counties to implement programs to reduce, recycle, and compost at least 50 percent of wastes by the year 2000 (PRC Section 41780). A jurisdiction's diversion rate is the percentage of its total waste that it diverts from disposal through reduction, reuse, and recycling programs. The state determines compliance with the mandate to divert 50 percent of generated waste[1] through a complex formula. This formula requires cities and counties to conduct empirical studies to establish a "base year" waste generation rate against which future diversion is measured. The diversion rates in subsequent years are then determined by deduction rather than by direct measurement of material recycled and composted—i.e., cities and counties track the amount of material disposed of at landfills, then subtract that amount from the base-year amount, and the difference is assumed to be diverted (PRC Section 41780.2).

As of 2006, the most recent year for which jurisdiction summary information is available, unincorporated San Mateo County's diversion rate was calculated at 64 percent, which is consistent with AB 939 (CIWMB, 2009e).

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[1] "Generated waste" includes both disposed and diverted waste.

Utility Notification Requirements

Title 8, Section 1541 of the California Code of Regulations requires excavators to determine the approximate locations of subsurface installations such as sewer, telephone, fuel, electric, and water lines (or any other subsurface installations that may reasonably be encountered during excavation work) prior to opening an excavation.

California law (California Government Code Sections 4216 et seq.) requires owners and operators of underground utilities to become members of and participate in a regional notification center such as Underground Service Alert-Northern California (USA North). According to Section 4216.1, operators of subsurface installations that are members of, participate in, and share in the costs of a regional notification center are in compliance with this section of the code. When USA North receives planned excavation reports from public or private excavators, it transmits those reports to all participating members that might have underground facilities at the location of the planned excavation. Members of the regional notification center then mark or stake their facilities, provide information, or give clearance to dig (USA North, 2009).

5.11.2.3 Local Regulations

San Mateo County General Plan

The *San Mateo County General Plan* contains goals and objectives that relate to the management of solid waste. The following goals and objectives relate to the LCSDI project: minimize dependence on landfills; advocate for source reduction and the reuse of recycled materials; and reduce solid waste requiring disposal (San Mateo County, 1986).

San Mateo County Requirements for Construction and Demolition Wastes

In an effort to meet the state's AB 939 waste reduction mandate, San Mateo County adopted Ordinance 04099, which requires all demolition projects over $5,000 and construction projects greater than $250,000 or 2,000 square feet to recycle 100 percent of all inert solids and 50 percent of all non-inerts. Inert solids are asphalt, brick, concrete, dirt, fines, rock, sand, soil, and stone. Compliance with this ordinance requires the preparation of a waste management plan (RecycleWorks, 2009).

5.11.3 Impacts and Mitigation Measures

5.11.3.1 Significance Criteria

The City and County of San Francisco has not formally adopted significance standards for impacts related to utilities and service systems, but generally considers that implementation of the proposed project would have a significant impact on utilities and service systems if it were to:

- Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board (RWQCB);

- Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;
- Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;
- Have insufficient water supply available to serve the project from existing entitlements and resources, or require new or expanded water supply resources or entitlements;
- Result in a determination by the wastewater treatment provider that would serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments;
- Require solid waste disposal services from a landfill with insufficient permitted capacity to accommodate the project's expected solid waste disposal needs; or
- Be non-compliant with federal, state, or local statutes and regulations related to solid waste.

In addition to the criteria listed above, this Environmental Impact Report (EIR) applies the following criterion and considers that the project would have a significant effect on utilities and service systems if it were to:

- Disrupt operation or require relocation of regional or local utilities.

Due to the nature of the proposed project, there would be no impacts related to the following criteria; therefore, no impact discussion is provided for these topics for the reasons described below:

- *Wastewater Treatment Requirements and Wastewater Treatment Capacity.* The three criteria used to evaluate impacts related to wastewater require an analysis of whether the project would exceed wastewater treatment requirements, result in the construction of new wastewater facilities, or exceed the capacity of wastewater treatment providers. Because implementation of the LCSDI project would not generate wastewater, wastewater treatment requirements as set forth by the RWQCB would not be exceeded. Wastewater quantities would not increase as a direct result of the project and would not cause any local wastewater treatment providers to exceed their treatment capacities; indirect effects of growth associated with the project, including effects on wastewater quantities, are addressed in Section 7.1, Growth-Inducing Impacts. Existing wastewater facilities in the LCSDI project area include restrooms at the Crystal Springs Pump Station. Implementation of the LCSDI project would not alter these facilities, and would not require the construction of additional facilities. As a result, the proposed project would have no impact related to wastewater, and this topic is not further analyzed in this EIR.
- *Sufficient Water Supply.* The proposed project would not directly alter water supply sources, but rather would serve as one component of a regional water system improvement program, as discussed and analyzed in the Program Environmental Impact Report (PEIR) for the Water System Improvement Program (WSIP) (San Francisco Planning Department, 2008). The proposed project's contribution to the WSIP's impacts related to water supply resources are thoroughly addressed in the PEIR. This project-level EIR tiers from the PEIR and also

incorporates by reference the relevant analyses of the PEIR with respect to the WSIP's water supply impacts and mitigation measures, as applicable to this project. See Section 5.1.3 and **Appendix D** of this EIR for more detail. This topic is not discussed further in this section.

5.11.3.2 Approach to Analysis

The analysis of project effects on public utilities and service systems encompasses temporary construction-related impacts, as well as potential long-term impacts on utilities associated with future operations. Short-term temporary disruption of service could occur if existing utilities and/or other facilities were accidentally damaged during relocation or other project-related construction activities. Long-term impacts on utilities could result if utilities were to become damaged or inundated from increased water surface elevations under future conditions.

This analysis also identifies potential impacts on landfill capacity from the disposal of LCSDI construction waste. Potential sources of solid waste from project construction activities include excavated concrete, rock, and soil. Although it is anticipated that excavated soil would be stockpiled and reused as backfill and in the course of the proposed construction of the SFPUC's Crystal Springs/ San Andreas (CSSA) Transmission Upgrade project, this analysis assumes that a portion of that soil would be disposed of in landfills. The analysis compares the available capacity of the Ox Mountain Sanitary Landfill with the estimated construction waste quantities.

5.11.3.3 Impact Summary

Table 5.11-1 summarizes the project's impacts on utilities and landfill capacity.

TABLE 5.11-1
SUMMARY OF IMPACTS – UTILITIES AND SERVICE SYSTEMS

	Significance Determination	
Impact	**LCSD Site**	**Sampling Station Site**
Impact UT-1: Potential temporary damage to or disruption of existing regional and local utilities.	PSM	LS
Impact UT-2: Impacts related to the relocation of utilities.	PSM	N/A
Impact UT-3: Temporary adverse effects on solid waste landfill capacity.	LS	LS
Impact UT-4: Impacts related to compliance with federal, state, and local solid waste statutes.	PSM	LS
Impact UT-5: Long-term effects on utilities and service systems.	LS	N/A
Impact C-UT: Cumulative impacts on utilities and service systems.	N/A	N/A

B = Beneficial impact
N/A = Not Applicable or no impact
LS = Less than Significant impact, no mitigation required
SM = Significant impact, can be Mitigated to less than significant
PSM = Potentially Significant impact, can be Mitigated to less than significant
SU = Significant Unavoidable impact
PSU = Potentially Significant Unavoidable impact

5.11.3.4 Construction Impacts

Impact UT-1: Potential temporary damage to or disruption of existing regional and local utilities.

Lower Crystal Springs Dam Vicinity

Existing public utilities within the project footprint that could potentially conflict with project construction activities include overhead electrical transmission lines owned by PG&E and a drainage pipe owned by Caltrans. Other facilities within the project footprint that could be affected by project construction include the USGS hydraulic monitoring station and seismographs owned by the CGS.

As described above in Section 5.11.1.1, an overhead 230-kV PG&E electrical transmission line currently extends across the Skyline Boulevard Bridge. The use of a crane or other high-standing construction equipment during construction work at the top of the dam could damage this overhead power line, resulting in safety hazards and/or disruption of local or regional electrical power. This is considered a *potentially significant* impact.

During project construction activities at the toe of the dam, the 30-inch stormwater drainage pipe that is owned by Caltrans that discharges to San Mateo Creek via the existing stilling basin would be temporarily supported on concrete anchor blocks to protect the pipe from breakage. Water that is currently discharged to the stilling basin by this pipe would be temporarily rerouted around the construction work area in order to maintain flow in the creek. Upon completion of construction activities, the concrete anchor blocks would be removed and the 30-inch stormwater drainage pipe would be re-routed to discharge into the new stilling basin. Temporary impacts related to potential damage to the 30-inch stormwater drainage pipe during construction activities would be *potentially significant.* In addition, construction activities at the LCSD site would require relocation of the USGS hydraulic monitoring station and removal and replacement of several CGS seismographs. During the construction phase, these facilities would be out of service for approximately 14 months. Temporary impacts related to damage and disruption of these facilities would be *potentially significant.*

Potentially significant impacts related to damage or disruption of existing utilities at the LCSD site would be reduced to a less-than-significant level with implementation of Mitigation Measure M-UT-1 (Coordinate Final Construction Plans with Affected Utilities). This measure requires that the SFPUC coordinate final construction plans with affected utilities and make arrangements regarding removal and relocation of utilities.

Sampling Station #5 Vicinity

There are no existing underground or aboveground utilities at the Sampling Station #5 site that could be potentially affected by project construction activities. The proposed improvements at this site would not involve construction within the Cañada Road right-of-way, the nearest utility corridor to the site. Staging would be within an established off-street work area. Therefore, potential impacts related to damage to or disruption of existing utilities at the Sampling Station site would be *less than significant.* No mitigation would be required.

Impact UT-2: Impacts related to the relocation of utilities.

Lower Crystal Springs Dam Vicinity

As part of demolition of the existing stilling basin, an approximately 60-foot-long segment of the 30-inch stormwater drainage pipe that collects runoff from I-280 would be rerouted around the work area to prevent water from flowing into the work zone. Although construction is scheduled during the dry season, the pipeline could contain stormwater following off-season precipitation events. As described in Chapter 3, Project Description, a Caltrans pipeline modification permit would be required. However, if SFPUC is unable to obtain this permit from Caltrans, the relocation of this pipeline could result in a *potentially significant* impact.

Construction activities at the LCSD site would also require relocation of the USGS hydraulic monitoring station as well as removal and replacement of the several CGS seismographs on the dam; this would be a *potentially significant* impact. With implementation of Mitigation Measure M-UT-1 (Coordinate Final Construction Plans with Affected Utilities), which requires a contractual agreement between the SFPUC and any utilities potentially affected by the project, impacts related to the relocation of the Caltrans pipeline, USGS monitoring station, and the CGS seismographs would be reduced to a less-than-significant level.

Sampling Station #5 Vicinity

Construction activities at the Sampling Station #5 site would not require relocation of any public utilities; therefore, *no impact* would occur.

Impact UT-3: Temporary adverse effects on solid waste landfill capacity.

Lower Crystal Springs Dam Vicinity

As described in Chapter 3, construction activities would result in an estimated 22,000 cubic yards of spoils consisting of concrete, rock, and organic matter. Of this total excavated material, approximately 15,400 cubic yards would be stockpiled at Staging Areas 1 and 4, and the remaining 6,600 cubic yards of unusable excavated material would be trucked to an off-site disposal location. Stockpiled material would be used as backfill around the stilling basin and in the course of the proposed construction of the SFPUC's CSSA Transmission Upgrade project. Of the 22,000 cubic yards of excavated material, demolition at the top and toe of the dam would produce approximately 1,300 cubic yards consisting of broken concrete. This concrete would be broken into drain-rock-size pieces and used to fill depressions; 950 cubic yards of this concrete would be trucked to the landfill. If the proposed project were to occur simultaneously with the proposed CSSA Transmission Upgrade project, some excavated soil could be utilized for the CSSA Transmission Upgrade project within the vicinity of the proposed new pump station. It is not expected that any hazardous waste would be produced at the site. However, if hazardous waste were encountered, the waste would be trucked to the closest hazardous waste disposal site in

Kettleman City. Refer to Section 5.16, Hazards and Hazardous Materials, for information regarding disposal of hazardous materials.

Assuming that a total of 6,600 cubic yards of excavated material is disposed of at the Ox Mountain Sanitary Landfill, the nearest landfill in the project vicinity, approximately 31,147,252 cubic yards of landfill capacity would remain at Ox Mountain. The project's contribution would be equal to less than 0.001 percent of the landfill's remaining capacity. However, if the remaining 15,400 cubic yards of excavated material cannot be stockpiled at Staging Areas 1 and 4 due to scheduling issues, this material could require disposal at the Ox Mountain Sanitary Landfill. With this additional 15,400 cubic yards of excavated material, approximately 31,131,852 cubic yards of landfill capacity would remain which would still amount to less than 0.001 percent of the landfill's remaining capacity. Because adequate landfill capacity exists to accept the project's construction waste, impacts related to exceeding permitted landfill capacity would be *less than significant.*

Sampling Station #5 Vicinity

Construction activities at the Sampling Station #5 site would consist of the following steps: removing the existing sampling station; moving it to one of the staging areas; excavating the footings; erecting a new steel frame structure on top of the footings; and mounting the sampling station on the new frame. Approximately 7 cubic yards of soil and construction debris would be excavated. Most soil would be reused as backfill once the new footings were re-installed. Some minor construction debris (including concrete) could be generated by construction activities but would not exceed landfill capacities. Thus, impacts related to landfill capacity would be *less than significant*. No mitigation is required.

Impact UT-4: Impacts related to compliance with federal, state, and local solid waste statutes.

Lower Crystal Springs Dam Vicinity

The construction contractor(s) would be required to dispose of solid waste in accordance with all applicable laws. Landfills are required to comply with state-mandated reductions in solid waste generation under the CIWMA of 1989, which requires all California cities and counties to begin implementing programs to reduce, recycle, and compost at least 50 percent of waste by January 1, 2000, and to divert at least 75 percent by 2010. Facilities in violation of these requirements are fined and could lose their permits to operate if required reductions are not met.

The Ox Mountain Sanitary Landfill could accommodate the total excavated spoils and construction debris generated by the proposed project. This landfill has an estimated 82% remaining capacity (31,153,852 cubic yards) that is currently permitted by the state (CIWMB, 2009a). Most of the solid waste generated by the project would consist of soil, rock, and organic matter. According to San Mateo County's demolition and construction waste ordinance (No. 04099), the SFPUC contractor would be required to divert at least 50 percent of the construction and demolition debris from landfill disposal. This project would divert approximately 6,600 cubic yards of excavated material to a landfill, which would constitute about 30 percent of the project's estimated total excavated material. All remaining excavated material (15,400 cubic yards) would be suitable for use as fill and would be stockpiled at Staging Areas 1 and 4 for future use under the CSSA Transmission Upgrade project. However, if this excavated material is not utilized under the CSSA Transmission Upgrade project, and thus requires off-site disposal at the Ox Mountain Sanitary Landfill, the project would be out of compliance with local solid waste statutes, resulting in a *potentially significant* impact. However, with implementation of Mitigation Measure M-UT-4 (Waste Management Plan), which would require preparation of a waste management plan to identify the types of debris that would be generated by the project and discuss the manner in which waste streams would be handled to comply with state and local solid waste statutes, this impact would be reduced to less than significant.

Sampling Station #5 Vicinity

As discussed under Impact UT-3, approximately 7 cubic yards of soil and construction debris would be generated at the Sampling Station #5 site. Most excavated soil would be reused onsite as backfill but some minor construction debris (including concrete) would be generated by construction activities. Due to the minor quantity of construction waste that would be generated during construction activities at this site, potential impacts associated with compliance with state and local solid waste statutes would be *less than significant*. No mitigation is required.

5.11.3.5 Operational Impacts

Impact UT-5: Long-term effects on utilities and service systems.

Lower Crystal Springs Dam Vicinity

As described in Section 3.7.2, Post-Construction Operations, with the project in place, the maximum normal water surface elevation would be 287.8 feet (4 feet higher than the current normal maximum of 283.8 feet), and could be as high as 291.8 feet during occasional exceedances. Because 291.8 feet is the historical maximum water surface elevation, it is not likely that utilities exist within the reservoir perimeter of the maximum future inundation zone. Thus, impacts related to damage to utilities and service systems from inundation during future operations are considered *less than significant*, and no mitigation is necessary.

Sampling Station #5 Vicinity

No utility lines or utility infrastructure at the Sampling Station #5 site would be potentially inundated or damaged by project operations. *No impact* would result.

5.11.3.6 Mitigation Measures

Mitigation Measure M-UT-1: Coordinate Final Construction Plans with Affected Utilities.

The SFPUC or its contractors shall coordinate final construction plans and specifications with Caltrans, PG&E, the USGS, the CGS, and any utilities potentially affected by the project. For each potentially affected utility provider, a contractual agreement or permit, as applicable, shall be completed and signed by the SFPUC and the utility agency. The agreement or permit shall specify appropriate procedures for managing the utilities to avoid damage and disruption to service during project-related construction activities.

Mitigation Measure M-UT-4: Waste Management Plan.

The construction contractor(s) shall prepare a waste management plan identifying the types of debris that shall be generated by the project and the manner in which those waste streams shall be handled. In accordance with the priorities of State Assembly Bill 989, the plan shall emphasize source reduction measures followed by recycling and composting methods to reduce the amount of waste being disposed of in landfills. The plan shall specify that 100 percent of inert solids (such as asphalt, brick, concrete, dirt, fines, sand, soil, and stone) must be diverted from disposal, and that 50 percent of all other non-inert materials (wood, metal, cardboard, green waste, gypsum, fixtures, etc.) must be diverted from landfills. The plan shall be reviewed by the SFPUC, and, upon project completion, the contractor shall submit receipts to the SFPUC documenting that the stated waste reuse, recycling, and disposal goals have been met.

5.11.3.7 Cumulative Impacts

Impact C-UT: Cumulative impacts on utilities and service systems.

The geographic scope of potential cumulative impacts on utilities and service systems encompasses the portions of the project area and its immediate vicinity that are within the service areas of regional service/utility providers.

Construction of the proposed project would not disrupt existing gas, wastewater, or water service lines. The utilities that could be affected include: a Caltrans 30-inch stormwater drainage pipe that diverts stormwater runoff from I-280 to the stilling basin; the PG&E Jefferson-Martin Transmission Line; a USGS hydraulic monitoring station; and seismographs owned by the CGS. Construction of other projects in the region could also increase the potential for utility impacts, resulting in potential cumulative impacts. However, these potential impacts would be site-specific rather than additive because of the localized nature of utilities and services within the specific construction sites and the limited extent of area served by those utilities or services. Thus, no cumulative impact would occur to which the project could contribute *(no impact)*.

Because of the existing, permitted regional landfill capacity, increases in landfill demand as a result of other projects listed in Section 5.1, Table 5.1-1, as well as the proposed project, would not constitute a significant cumulative impact on the ability for landfills to accommodate the region's expected solid waste disposal needs. In addition, the proposed project's demand on landfills (i.e., disposal of construction waste) represents less than 0.0001 percent of the total existing landfill capacity in San Mateo County. Implementation of Mitigation Measure M-UT-4 (Waste Management Plan) would ensure that the proposed project would promote source reduction and recycling of waste to offset any incremental contribution to landfill capacity. The waste management plan would require that 100 percent of inert solids (such as excavated asphalt, concrete, and soil) be diverted from disposal and that 50 percent of all other non-inert materials (such as wood, metal, and green waste) be diverted from landfills. Thus, no cumulative impact would occur to which the project could contribute *(no impact).*

5.11.4 References

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5.12 Public Services

This section describes the existing conditions and regulatory setting for public services in the Lower Crystal Springs Dam Improvements (LCSDI) area and assesses potential impacts on public services that could result from implementation of the proposed project. Public services addressed in this section include law enforcement services and fire protection services.

5.12.1 Setting

The proposed project is located entirely within the SFPUC Peninsula watershed lands in unincorporated San Mateo County. The SFPUC Peninsula watershed encompasses 23,000 acres of open space lands used primarily for water collection, transmission, and storage, and includes groundskeeper cottages and maintenance structures. Portions of the watershed land and adjacent areas are used for recreation, and rural housing exists in nearby communities.

5.12.1.1 Law Enforcement Services

The San Mateo County Sheriff's Office provides law enforcement services to the contract communities of Portola Valley and Woodside and unincorporated areas of San Mateo County, including the portion of the SFPUC Peninsula watershed that encompasses the project site. The office closest to the project area is the Eichler Highlands office in San Mateo, in Community Service Area 1. However, considering that responders are on mobile patrol, most responses are not made from a specific office. Responses to calls could also dispatch from the San Mateo County Offices at 400 County Center in downtown Redwood City. A deputy or officer of higher rank would respond to calls in the project area, and the response time would depend on other calls or emergencies being addressed by the Sheriff's Office at the time of the call.

The SFPUC maintains six cottages in the Peninsula watershed where SFPUC Natural Resources Division staff reside. These staff members enforce federal, state, county, and watershed policies, rules, and regulations to minimize dumping, poaching, and other trespass and illegal activities in the Peninsula watershed, including the project area, during daylight hours and at night when circumstances warrant it. The SFPUC Natural Resources Division personnel also contact the San Mateo County Sheriff's Office when needed to address criminal violations in the Peninsula watershed.

5.12.1.2 Fire Protection Services

The California Department of Forestry and Fire Protection (CAL FIRE) provides fire protection services to the SFPUC Peninsula watershed, including the project area. CAL FIRE has designated the watershed as a State Responsibility Area, defined in California Public Resources Code Sections 4125–4127 as lands for which the state has financial responsibility with respect to preventing and suppressing fires (CAL FIRE, 2007). Services provided by CAL FIRE include emergency response, hazardous materials spill response, medical aid, and wildland fire suppression and training.

The CAL FIRE station nearest to the project area is Fire Station 17, which is at 20 Tower Road near Highway 92 in Belmont in the San Mateo–Santa Cruz Unit, approximately 2.5 miles southeast of the Crystal Springs Pump Station. In the event of a fire emergency at any of the project component sites, CAL FIRE would be dispatched as the first response team.

No major fires have occurred within Peninsula watershed lands, including the project area, since 1946. There were a few small fires during the 1960s and 1970s, some of which were characterized as suspicious, related to illegal camping or the result of fireworks. Historically, large fires have been concentrated in the northern portion of the watershed, outside the project area. In addition, the roads and highways that bisect and border the project area have not been a major source of recorded ignitions. Fire-suppression infrastructure in the project area includes strategically located water tanks (which are Cal FIRE–compatible), two 4,000-gallon water trucks, and individual patrol rigs with smaller firefighting water tanks.

5.12.2 Regulatory Framework

5.12.1 Federal Regulations

There are no federal regulations governing public services that apply to the LCSDI project.

5.12.2 State Regulations

California Public Resources Code

Fire protection services are legally bound to various requirements contained in the California Public Resources Code. These requirements primarily include equipment and construction area protocols to which contractors must adhere during construction activities. See Section 5.16, Hazards and Hazardous Materials, for regulations pertaining to wildland fires.

California Health and Safety Code

Law enforcement and fire protection services are legally bound to various requirements contained in the California Health and Safety Code.

5.12.3 Local Regulations

SFPUC Peninsula Watershed Management Plan

The *Peninsula Watershed Management Plan* (Peninsula WMP) provides a policy framework for the SFPUC to make management decisions about the activities, practices, and procedures that are appropriate on SFPUC lands in the Peninsula watershed. With respect to public services, the Peninsula WMP outlines requirements related to fire protection services that include procedures that contractors must adhere to during construction activities. See Section 5.16, Hazards and Hazardous Materials, for pertinent Peninsula WMP policies related to fire prevention within the Peninsula watershed.

5.12.3 Impacts and Mitigation Measures

5.12.3.1 Significance Criteria

The City and County of San Francisco has not formally adopted significance standards for impacts related to public services, but generally considers that implementation of the proposed project would have a significant impact if it were to:

- Result in substantial adverse physical impacts associated with the provision of, or the need for, new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any public services such as fire protection, police protection, schools, parks, or other services.

Due to the nature of the proposed project, there would be no impacts related to the following criterion for the reasons described below:

> *Result in Substantial Adverse Impacts Associated with the Provision of, or the Need for, New or Physically Altered Governmental Facilities*. During the proposed 14-month construction period, between 20 and 45 construction workers would be employed at the Lower Crystal Springs Dam (LCSD) site, and 2 to 10 workers would be employed at the sampling station site (see Chapter 3, Section 3.6.2.3, Workforce and Equipment). It is expected that the construction workers could come from any part of the Bay Area. While some workers might temporarily relocate from other areas, the proposed project would not result in a substantial increase in local populations. Potential incidents requiring law enforcement, fire protection, or emergency services could occur during construction; however, the potential temporary increase in incidents would not exceed the capacity of local law enforcement, fire protection, and emergency facilities such that new or expanded facilities would be required. Construction of the proposed project would not result in impacts related to the need for new or physically altered governmental facilities in order to maintain existing levels of public services, and no construction-related impacts would occur.
>
> Operation and post-construction maintenance activities would be similar to existing maintenance activities and would not result in substantial increases in the demand for public services, including fire protection, police protection, schools, parks, or other services. Therefore, operational impacts related to public services are not applicable.

5.12.3.2 Impacts

As described above, implementation of the proposed project would not result in impacts related to public services. Therefore, there are no impacts under this topic.

5.12.3.3 Mitigation Measures

None required.

5.12.3.4 Cumulative Impacts

Implementation of the proposed project would not result in any cumulative impacts related to public services because the project would not result in any project-specific impacts related to this topic.

5.12.4 References

California Department of Forestry and Fire Protection (CAL FIRE), Fire and Resource Assessment Program: San Mateo County Fire Hazard Severity Zones in State Responsibility Area Map. Adopted November 7, 2007, available online at http://frap.cdf.ca.gov/webdata/maps/san_mateo/fhszs_map.41.pdf.

5.13 Biological Resources

This section addresses potential impacts on biological resources that could occur with implementation of the Lower Crystal Springs Dam Improvements project (LCSDI or proposed project). The section is divided into two main parts: Terrestrial and Wetland Resources (Sections 5.13.1 through 5.13.4) and Fisheries (Sections 5.13.5 through 5.13.8). Terrestrial and Wetland Resources include terrestrial, wetland, and non-fish aquatic species, sensitive habitats, special-status plant and animal species, and protected trees; Fisheries include fish species and their aquatic habitats, with focus on special-status fish species. Much of the analysis included herein considers the effects of reservoir operations, and frequent references are made to additional or complementary information presented in Section 5.15, Hydrology and Water Quality.

5.13.1 Setting – Terrestrial and Wetland Resources

5.13.1.1 Information Sources and Survey Methodology

The principal sources for this analysis were the *Wetland Determination Report* (Entrix/MSE, 2007) and *Biological Resources Technical Report* (Entrix, 2009), both prepared specifically for the LCSDI project and included as Appendices H and I to this EIR. These documents report the results of extensive wetland, flora, and fauna surveys in detail, and describe the methods used and level of effort expended. ESA+Orion carried out some additional biological resource surveys and wetland delineation surveys in connection with the development of mitigation sites (ESA+Orion, in prep.). In addition, a wetland delineation prepared for another Water System Improvement Program (WSIP) project—the Pulgas Discharge Channel Modifications—fully encompassed the project area for Sampling Station #5 (NRM Environmental Consulting, 2007), and provided information on that site. In all cases, surveyors possessed the appropriate permits and operated according to accepted professional practice and agency protocols.

Additional information was obtained from the California Natural Diversity Database (CNDDB) (CDFG, 2009a, 2009b, 2009c), California Native Plant Society Electronic Inventory (CNPS, 2009), U.S. Fish and Wildlife Service (USFWS, 2009), web-based sources (eBird, 2009), and standard biological literature.

5.13.1.2 Definitions

Project Area, Study Area, Project Vicinity

For this analysis, the *project area* is defined as: the shoreline of both Upper and Lower Crystal Springs Reservoirs within the 291.8-foot contour line (sometimes referred to as the 292-foot elevation); areas at the base of Lower Crystal Springs Dam (LCSD) that are within the construction limits of the project; an area on the southeastern shore of Lower Crystal Springs Reservoir known as the Boat Ramp, which is proposed to provide access for barges required for construction; and Sampling Station #5, an ancillary project component at the Pulgas Discharge Channel, about four miles south of the LCSD. For the purpose of studies and surveys, the *project* *study area* includes the lands within the project area and immediately adjacent lands, creating a contiguous area around the project area within which indirect impacts might occur. The term *project vicinity* is occasionally used when discussing lands that lie outside of the project study area but which might be used by transients (e.g., birds with large foraging areas).

Special-Status Plant and Animal Species

Special-status plant and animal species are defined as those listed under the Federal Endangered Species Act, Federal Marine Mammal Protection Act, California Endangered Species Act, California Fish and Game Code, and the California Native Plant Protection Act as endangered, threatened, or depleted; species that are candidates or proposed for listing; species that are designated as rare or fully protected; or plants listed as List 1A, 1B, or 2 by the California Native Plant Society (CNPS).

Locally rare species, as defined by the California Environmental Quality Act (CEQA) Guidelines (Section 15380), include species that are designated by various federal, state, and local agencies, organizations, and watch lists as sensitive, declining, rare, locally endemic, or as having limited or restricted distribution. Species identified by the California Department of Fish and Game (CDFG) as "special animals" are discussed in this section, but are not considered special-status species.

Special-status or sensitive natural community is defined as a natural community that is unique in its constituent components, restricted in distribution, supported by distinctive soil conditions, considered locally rare, potentially supporting special-status plant or wildlife species, and/or that receives regulatory recognition from municipal, county, state, and/or federal entities such as the CNDDB.

Special-status biological resources include special-status plants, animals, and natural communities, in addition to wetlands and other waters of the U.S. and state as defined by the U.S. Army Corps of Engineers (Corps), CDFG, and the San Francisco Bay Regional Water Quality Control Board (RWQCB) (details presented in Section 5.13.2, Regulatory Framework, below).

5.13.1.3 Regional Setting

Crystal Springs Reservoir, which includes both Upper and Lower Crystal Springs Reservoirs, occupies a valley in the San Andreas Rift Zone of the Coast Ranges between the Sawyer and Cahill Ridges on the west and the Buri Buri and Pulgas Ridges on the east. Because of its location in mountains adjacent to the coast, the watershed for these reservoirs has a high environmental diversity (Oberlander, 1953), including variation in fog, precipitation, topography, and soils. In general, vegetation in the project area is dominated by mixed hardwood forest, oak woodland and scrub on the western side, and oak woodland and non-native annual grassland on the east side. The southern end of Upper Crystal Springs Reservoir is dominated by mixed willow riparian forest, while the reservoir margins and inlets are vegetated by freshwater marsh and seasonal wetlands.

Vegetation Communities and Wildlife Habitats

Upland vegetation communities within the project area include grassland, northern (Franciscan) coastal sage scrub, northern mixed chaparral, coast live oak woodland, non-native woodland, and mixed evergreen forest. Riparian, aquatic, and seasonally wet areas include Central Coast riparian scrub as well as coastal and valley freshwater marsh/vernal marsh. Aquatic habitats include lacustrine[1] and riverine areas. These communities are mapped in **Figure 5.13-1**.

General community descriptions are derived from Holland (1986) and other sources where indicated. A brief description of these communities and associated wildlife, and their location within the project area, is provided below.

Grassland Communities

Non-native Grassland

The non-native grassland communities include a heterogeneous mix of non-native grasses, annual forbs, and wildflowers. These communities are characterized by a dense to sparse cover of annual grasses with flowering stems approximately 1 to 2 feet high. They are often associated with numerous species of showy-flowered, native annual forbs (wildflowers), especially in years of favorable rainfall. Germination occurs with the onset of the late fall rains; growth, flowering, and seed-set occur from winter through spring. With a few exceptions, the plants are dead through the summer-fall dry season, persisting as seeds. This community type is distributed throughout the valleys and foothills of most of California (except for the northern coastal and desert regions), usually below 3,000 feet (Holland, 1986).

Dominant plant species found in non-native grasslands within the project area include introduced annual grasses such as wild oat (*Avena fatua*), ripgut brome (*Bromus diandrus*), barley (*Hordeum* spp.), and fescue (*Vulpia* spp.). Herbaceous forbs and wildflowers include fiddleneck (*Amsinckia* spp.), shortpod mustard (*Hirschfeldia incana*), filaree (*Erodium* spp.), and yellow star thistle (*Centaurea solstitialis*). Non-native grassland is found throughout the project area. Intermittent patches occur along the western shore of both Upper and Lower Crystal Springs Reservoirs, generally associated with inlets that have a gently sloping shoreline. Extensive grassland communities are present along the eastern shore of both reservoirs and include elements of serpentine grasslands.

Serpentine Bunchgrass

The CDFG designates serpentine bunchgrass as a sensitive natural community where serpentine soils are present (i.e., those derived from igneous and meta-igneous rocks with very low silica content). This community supports a much higher proportion of native perennial grasses and has high native plant species diversity. It is found extensively on the eastern shore of Upper and Lower Crystal Springs Reservoir.

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[1] "Lacustrine" refers to both the water body of a lake as well as its bed and shoreline.

Characteristic wildlife species generally found in grasslands include western fence lizard (*Sceloporus occidentalis*), western rattlesnake (*Crotalus viridis*), western harvest mouse (*Reithrodontomys megalotis*), coyote (*Canis latrans*), and western meadowlark (*Sturnella neglecta*) (Mayer and Laudenslayer, 1988). Annual grasslands also serve as foraging habitat for many predatory species such as American kestrel (*Falco sparverius*) and white-tailed kite (*Elanus leucurus*). Annual grasslands within the project area provide nesting habitat for western pond turtle (*Clemmys marmorata*).

Chaparral and Scrub Communities

Scrub and chaparral communities are found on both the eastern and western sides of the project area, particularly in association with south-facing slopes. In general, scrub communities are dominated by low shrub species in various densities, with or without a grassy-herbaceous understory. Chaparral cover types are defined by a dense colony of woody, broad- and hard-leaved shrubs, generally reaching several feet in height. These communities are well adapted to disturbance by fire and generally occupy dry, rocky slopes with little soil development. Scrub and chaparral communities within the project area include northern (Franciscan) coastal sage scrub and northern mixed chaparral.

Northern Coastal Sage Scrub

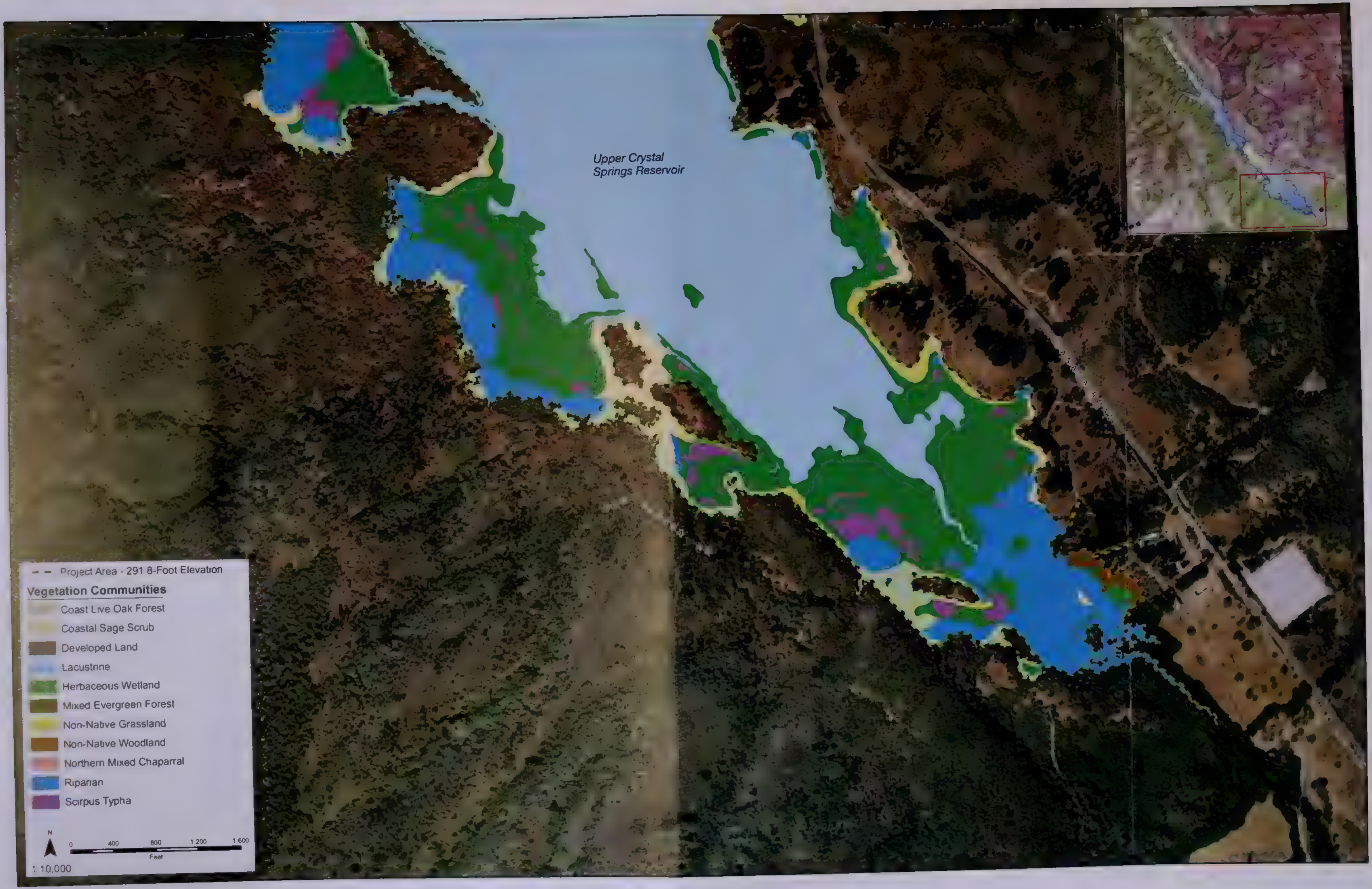
Northern (Franciscan) coastal sage scrub is described by Holland (1986) as sage scrub composed of low shrubs (approximately 1 to 6 feet tall) that form a dense patch with scattered grassy openings. Growth occurs in late spring and early summer. Sage scrub is generally found on exposed, often south-facing slopes with shallow, rocky soils.

Dominant species include California sagebrush (*Artemisia californica*), golden yarrow (*Eriophyllum confertiflorum*), coyote brush (*Baccharis pilularis*), California coffeeberry (*Rhamnus californica*), elderberry (*Sambucus mexicana*), sticky monkey flower (*Mimulus aurantiacus*), poison oak (*Toxicodendron diversilobum*), and various sage (*Salvia* spp.) species (Holland, 1986). Some areas mapped as coastal scrub are primarily dominated by coyote brush and/or poison oak. In the project area, coastal scrub is generally found along the eastern shore of both reservoirs.

Coastal scrub appears to support numbers of vertebrate species roughly equivalent to those in surrounding habitats. Wildlife typically found in coastal scrub habitats include western scrub jay (*Aphelocoma californica*), lesser goldfinch (*Carduelis psaltria*), Bewick's wren (*Thryomanes bewickii*), blacktailed jackrabbit (*Lepus californicus*), and California kingsnake (*Lampropeltis getula*) (Mayer and Laudenslayer, 1988).

Northern Mixed Chaparral

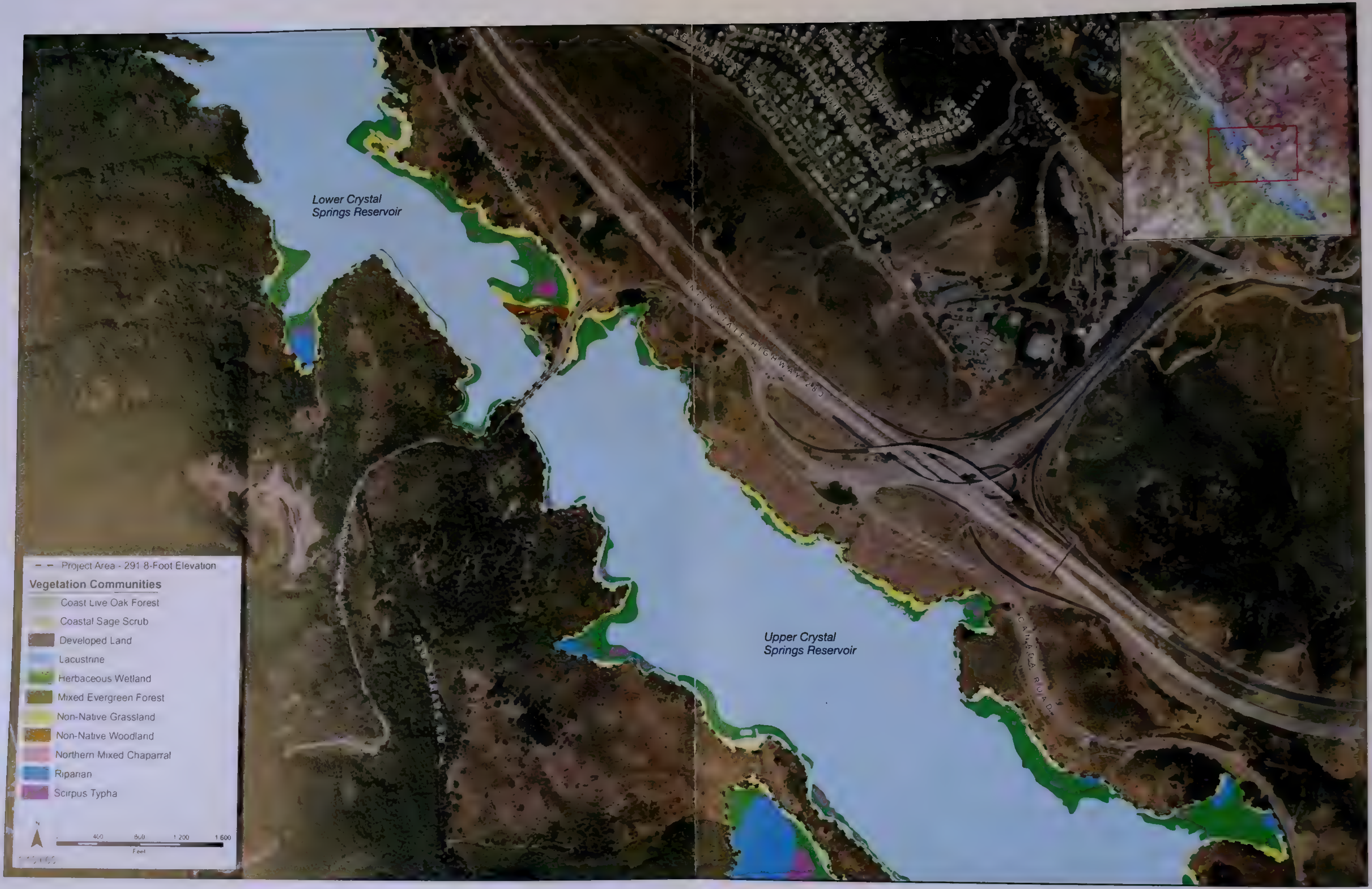
Northern mixed chaparral, classified by Holland (1986) as a subset of upper Sonoran mixed chaparral, is a chaparral community composed of shrubs that are 6 to 12 feet tall. These shrubs form dense vegetation stands with no appreciable understory and a considerable accumulation of leaf litter. Dominant species include scrub oak (*Quercus* sp.), chamise (*Adenostoma fasciculatum*),



SOURCE: Entrix, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.13-1a
Vegetation Communities

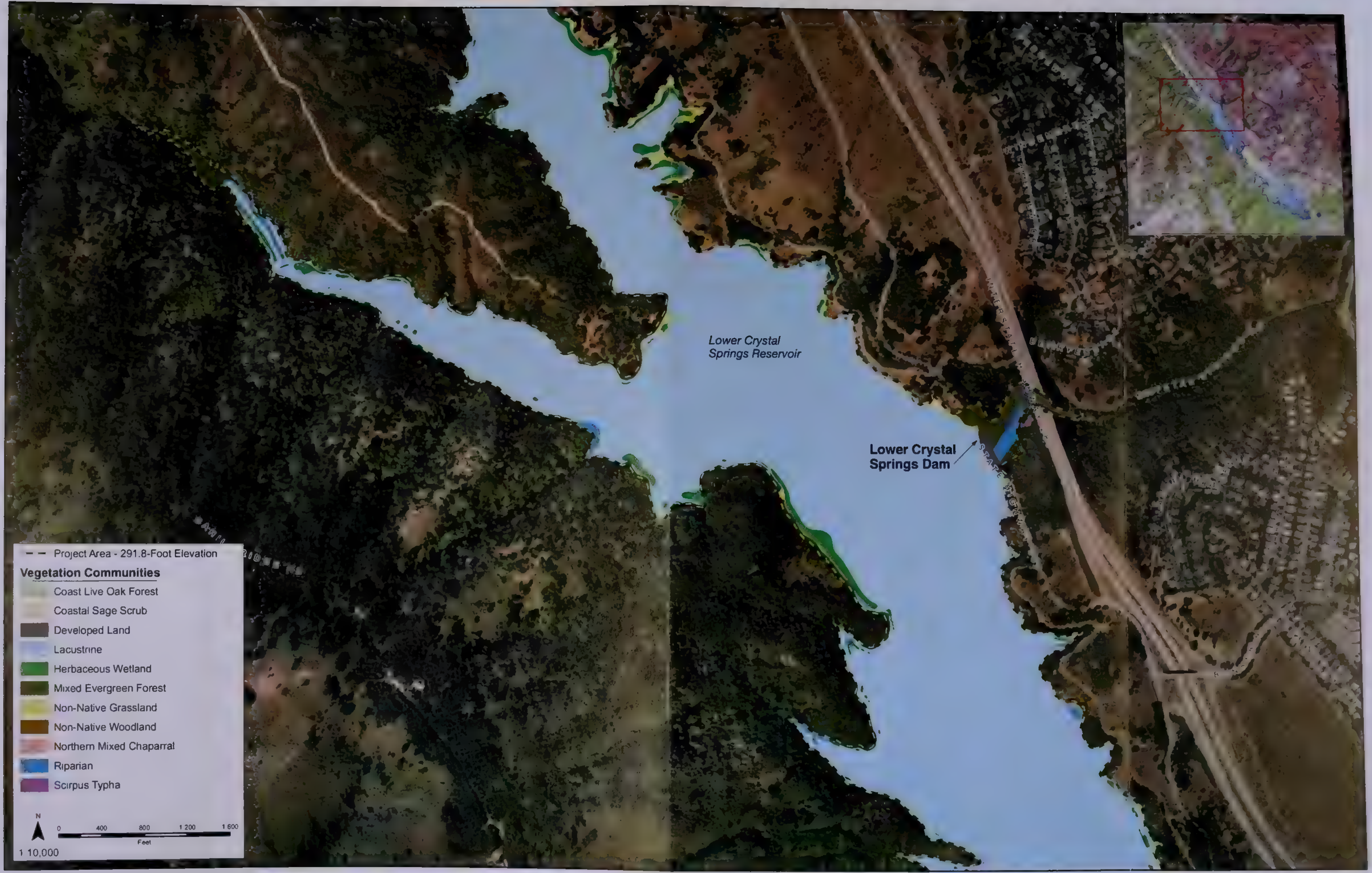


SOURCE Entrix, 2006

SFPUC Lower Crystal Springs Dam Improvements

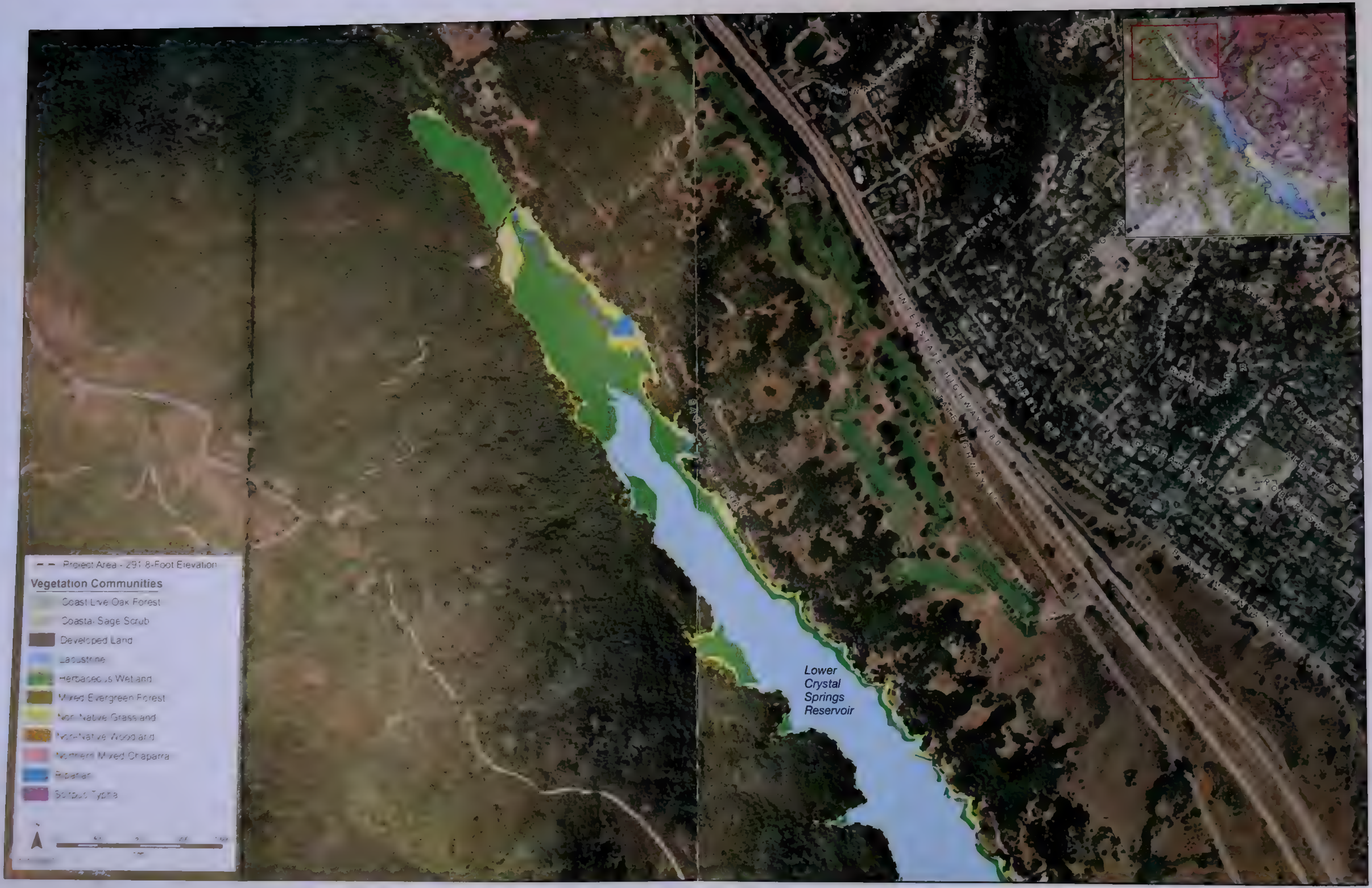
Figure 5.13-1b

Vegetation Communities



SOURCE: Entrix, 2009

Figure 5.13-1c
Vegetation Communities



SFPUC Lower Crystal Springs Dam Improvements

Figure 5.13-1d

Vegetation Communities

and any one of several types of manzanita (*Arctostaphylos* spp.) and ceanothus or buckbrush (*Ceanothus* sp.). Several areas on the western shore of Lower Crystal Springs Reservoir are dominated exclusively by chamise. Northern mixed chaparral is found along the western shore of Lower Crystal Springs Reservoir.

No wildlife species are restricted solely to mixed chaparral. Most species are found in other shrub-dominated habitats, such as those mentioned for coastal scrub. Common species include Anna's hummingbird (*Calypte anna*), wrentit (*Chamaea fasciata*), spotted towhee (*Pipilo maculatus*), western fence lizard, brush rabbit (*Sylvilagus bachmani*), and mule deer (*Odocoileus hemionus*) (Mayer and Laudenslayer, 1988).

Woodland Communities

Woodland cover types range from very open savanna with a grassland ground layer to dense forested areas with nearly impenetrable shrub understories. Within the project area, woodland-dominated vegetation communities dominate on cooler, more mesic,[2] north-facing slopes, as well as in canyons and ravines.

Coast Live Oak Forest and Woodland

Coast live oak forest and woodland (henceforth referred to collectively as coast live oak woodland) typically has one dominant tree—the coast live oak (*Quercus agrifolia*)—a broad-crowned evergreen tree up to 80 feet in height. The shrub layer in this community is poorly developed, but may include toyon (*Heteromeles arbutifolia*), currant (*Ribes* spp.), and Mexican elderberry (*Sambucus mexicana*). The herb component is generally dominated by brome grasses and several other introduced taxa. This community typically occurs on north-facing slopes and other exposed sites (Holland, 1986).

Within the project area, communities dominated by coast live oak are extremely variable. The overstory consists of deciduous and evergreen hardwoods, including coast live oak, madrone (*Arbutus menziesii*), and California bay (*Umbellularia californica*). Common understory species include poison oak. In drier sites, the trees are widely spaced, and form an open woodland or savannah. Oak-dominated communities occur throughout the project area, but are most common on the western shore of Upper Crystal Springs Reservoir and the southwestern shore of Lower Crystal Springs Reservoir.

Coastal oak woodlands provide habitat for a variety of wildlife species. At least 60 species of mammals are reported to use oaks in some way (Barrett, 1980). As many as 110 species of birds have been observed during the breeding season in California habitats where oaks form a significant part of the canopy or sub-canopy (Verner, 1980). Typical species in coastal oak woodlands include California quail (*Callipepla californica*), bushtit (*Psaltriparus minimus*), Nuttall's woodpecker (*Picoides nuttallii*), western fence lizard, and mule deer (Mayer and Laudenslayer, 1988).

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[2] Refers to sites that are characterized by intermediate moisture conditions that are neither very wet nor very dry.

Non-native Woodland

This woodland community is represented by introduced trees, including eucalyptus (*Eucalyptus* sp.), acacia (*Acacia* sp.), Monterey pine (*Pinus radiata*), and Monterey cypress (*Cupressus macrocarpa*). The latter two species are native, but are not native to the inland Bay Area and therefore are not protected in this area. Several locations in the project area have artificial plantings of each of these species. Monterey pine is most common on the eastern shore of Upper Crystal Springs Reservoir, while acacia is common on the eastern shore of Lower Crystal Springs Reservoir. Monterey cypress and eucalyptus are found intermittently, but are most common on the western shore of both reservoirs.

Mixed Evergreen Forest

Mixed evergreen forest is dominated by broadleaved trees forming a closed forest. These trees are usually 30 to 90 feet tall, but taller conifers are often interspersed. Site conditions include moist, well-drained, coarse soils, usually on slopes. Within the project area, this community is generally composed of a pronounced hardwood tree layer, with a poorly developed shrub stratum and a sparse herbaceous layer. Common species include Douglas-fir (*Pseudotsuga menziesii*), madrone, coast live oak, and California bay. Impenetrable poison oak thickets dominate the understory shrub layer. These stands are found primarily on steep northern and eastern exposures. Canopy cover is dense (75 to 80 percent), and canopy height varies from 50 to 100 feet high.

Bird and animal species characteristic of the montane[3] hardwood habitat include acorn woodpecker (*Melanerpes formicivorus*), band-tailed pigeon (*Columba fasciata*), California ground squirrel (*Spermophilus beecheyi*), dusky-footed woodrat (*Neotoma fuscipes*), ensatina (*Ensatina eschscholtzii*), slender salamander (*Batrachoseps* spp.), and sharp-tailed snake (*Diadophis punctatus*) (Mayer and Laudenslayer, 1988).

In the project area, mixed evergreen forest is found primarily along the western shore of Lower Crystal Springs Reservoir.

Riparian and Wetland Plant Communities

Riparian

Riparian areas in the project vicinity are similar to the Central Coast riparian scrub described by Holland (1986). This riparian scrub is a scrubby streamside thicket, varying from open to impenetrable and dominated by various willow species (*Salix* spp.) (Holland, 1986). Central Coast riparian scrub is a dense riparian forest associated with river corridors, seeps, and other wetlands. Canopy height ranges from 15 to 65 feet tall. Within the project area, most of the riparian vegetation is composed of dense stands of willow monotypes, including sandbar willow (*Salix exigua*) and arroyo willow (*Salix lasiolepis*). On the reservoir shorelines (and along perennial and intermittent drainages feeding into the reservoirs), the species include shining willow (*Salix*

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[3] Habitat composed of a pronounced hardwood tree layer with a poorly developed shrub layer and a sparse herb layer (Mayer and Laudenslayer, 1988).

lucida), big leaf maple (*Acer macrophyllum*), and Fremont cottonwood (*Populus fremontii*). Below the LCSD, willows dominate the riparian corridor, interspersed with some larger cottonwoods.

Riparian forests and scrubs are extremely rich in their associated fauna. Many species of birds, such as yellow warbler (*Dendroica petechia*), are riparian obligate breeders. Black phoebe (*Sayornis nigricans*) and red-shouldered hawk (*Buteo lineatus*) are also associated with riparian habitats. Vagrant shrew (*Sorex vagrans*) is a common mammalian species within the riparian woodlands of the San Francisco Peninsula. Common herpetological species associated with riparian habitats are western pond turtle, garter snake (*Thamnophis* spp.), Pacific chorus frog (*Pseudacris regilla*), and western toad (*Bufo boreas*).

Freshwater Marsh

Freshwater marsh communities within the project area comprise characteristic vernal (seasonal) marsh as well as coastal and valley freshwater marsh, as described by Holland (1986). The coastal and valley freshwater marsh community is dominated by perennial, emergent monocots such as cattails (*Typha* spp.) and bulrushes (*Scirpus* spp.). Vegetation is typically 2 to 5 feet tall, with a closed canopy. This community occurs in permanently flooded, freshwater sites that are lacking a significant current (Holland, 1986). Vernal marsh communities are dominated by low-growing annual herbs, often flowering behind the retreating waters edge as the marsh dries. Sites are marshy, with standing water following winter rains, and are generally dry by summer (Holland, 1986). Seasonal and permanent freshwater marsh communities are found in association with the shoreline of both reservoirs, especially in calm inlets and coves with gently sloping shorelines. Extensive areas of freshwater marsh are found at the northern end of Lower Crystal Springs Reservoir and the southern end of Upper Crystal Springs Reservoir.

This habitat provides a high-quality seasonal resource for red-winged blackbirds (*Agelaius phoeniceus*), egrets and herons (family *Ardeidae*), garter snakes (*Thamnophis* spp.), frogs (family *Ranidae*), and waterfowl—such as American coot (*Fulica americana*) and mallard duck (*Anas platyrhynchos*)—as well as shorebirds such as Wilson's snipe (*Gallinago delicata*) and many others (Mayer and Laudenslayer, 1988).

Aquatic Habitats

Lacustrine and Riverine

Upper and Lower Crystal Spring Reservoirs provide extensive lacustrine habitat in the project area. Lacustrine habitats are inland depressions or dammed riverine channels containing standing water (Cowardin et al., 1979). In general, lacustrine areas are too deep to support vegetation. As with most reservoirs, the lake shoreline fluctuation zone also contains ruderal and barren areas that are generally devoid of vegetation in addition to supporting the wetlands described above. Resources for wildlife within lacustrine habitats include numerous forms of aquatic insects that provide forage for many species of insectivorous fish, birds, and bats. Within lacustrine habitats, amphibian species deposit their eggs and larvae develop. Riverine habitats are present along the short sections of small tributary streams within the project area and support species such as Pacific giant salamander (*Dicamptodon tenebrosus*), which have been observed in Spring Creek, a tributary to Laguna Creek. Section 5.13.5, below, provides further discussion of the fishery resources in reservoir and stream habitats.

Sensitive Natural Communities

The CNDDB search for special-status resources in the LCSDI project study area identified four sensitive plant communities: northern maritime chaparral, valley needlegrass grassland, valley oak woodland, and serpentine bunchgrass. Only one of these communities, serpentine bunchgrass, has been reported in the project area.

Serpentine Bunchgrass

As noted above, serpentine bunchgrass is listed by the CNDDB as a sensitive plant community and is a community restricted to serpentine soils (CDFG, 2009c). This vegetation community is characterized by open grasslands predominantly composed of native perennial grasses (Holland, 1986). Common species found include hayfield tarweed (*Hemizonia luzulaefolia*), California melic (*Melica californica*), Chilean lotus (*Lotus wrangelianus*), pine bluegrass (*Poa secunda*), nodding needlegrass (*Nasella cernua*), foothill needlegrass (*Nasella lepida*), purple needlegrass (*Nasella pulchra*), California poppy (*Eschscholzia californica*), and small fescue (*Vulpia microstachys*).

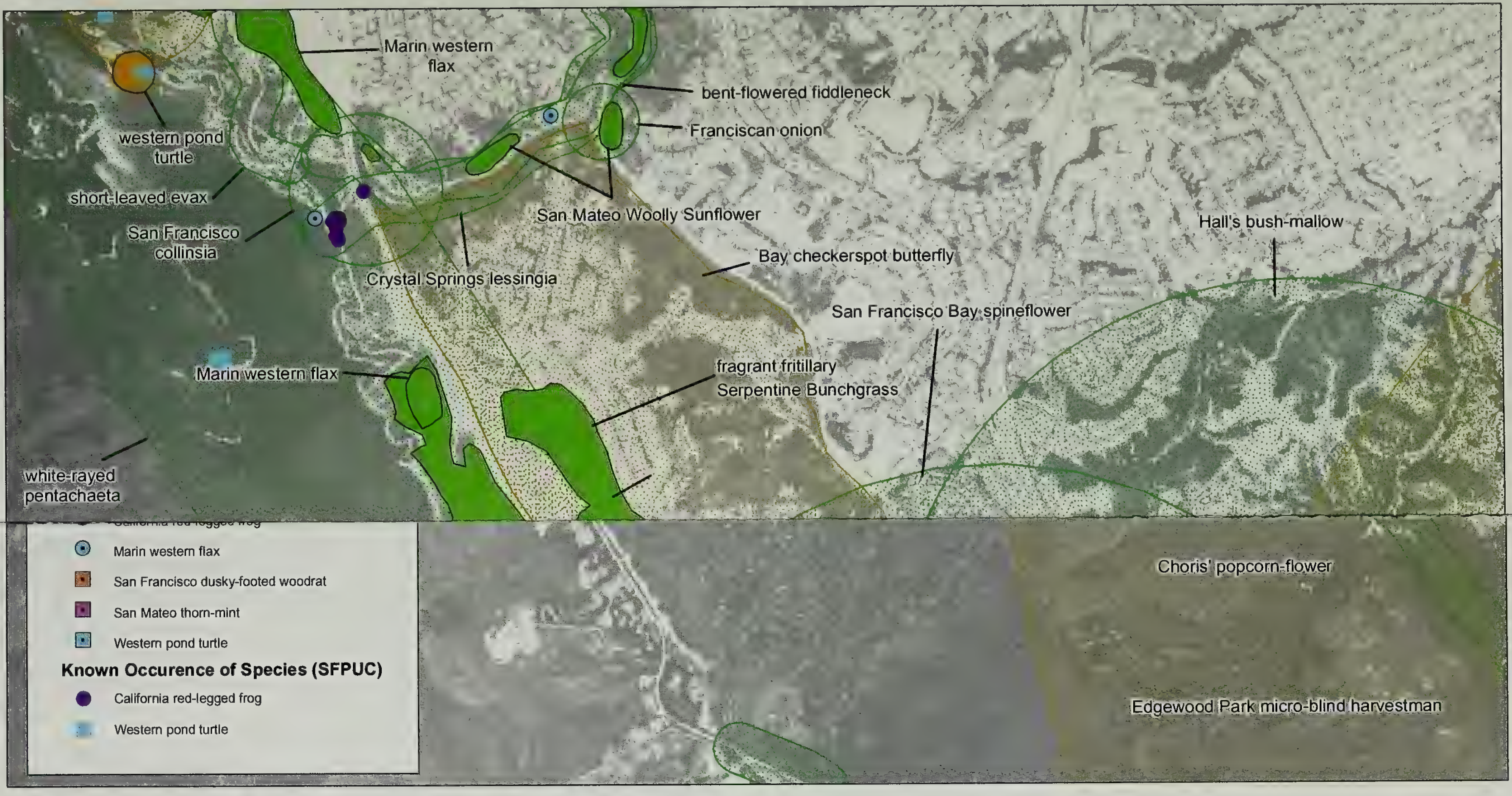
In the project study area, this community has been mapped extensively along the eastern shore of both Upper and Lower Crystal Springs Reservoirs. However, non-native annual grasses dominate the serpentine areas in the project area. The serpentine element is represented by native forbs characteristic of serpentine grasslands and by interspersed areas with needlegrass.

Special-Status Species

Special-status species that could be present in the project area include plants, terrestrial wildlife, and aquatic wildlife. A list of special-status species with the potential to occur in the project area was compiled through reviews of a number of sources, including available literature, related databases, and web-based resources. Sources included the CNDDB (CDFG, 2009a, 2009b, 2009c) as well as the USFWS Sacramento District website (USFWS, 2009). Both the CNDDB and the USFWS website were queried by 7.5-minute quadrangle; the quadrangles used for this project included Montara Mountain, San Mateo, and Woodside. The identity and distribution of known special-status species in the project area are shown in **Figure 5.13-2**. Additional species were included in the analysis based on known distribution, habitat requirements, and/or incidental sightings. Potential special-status species for which habitat (including foraging habitat) is present in the project area are evaluated in the following sections.

Special-Status Plant Species

Based on data in the CNDDB and other literature sources, 33 special-status plant species were initially identified as potentially occurring in the project vicinity (CDFG, 2009c; USFWS, 2009). An analysis of species distribution, known occurrences, and habitat requirements produced a list

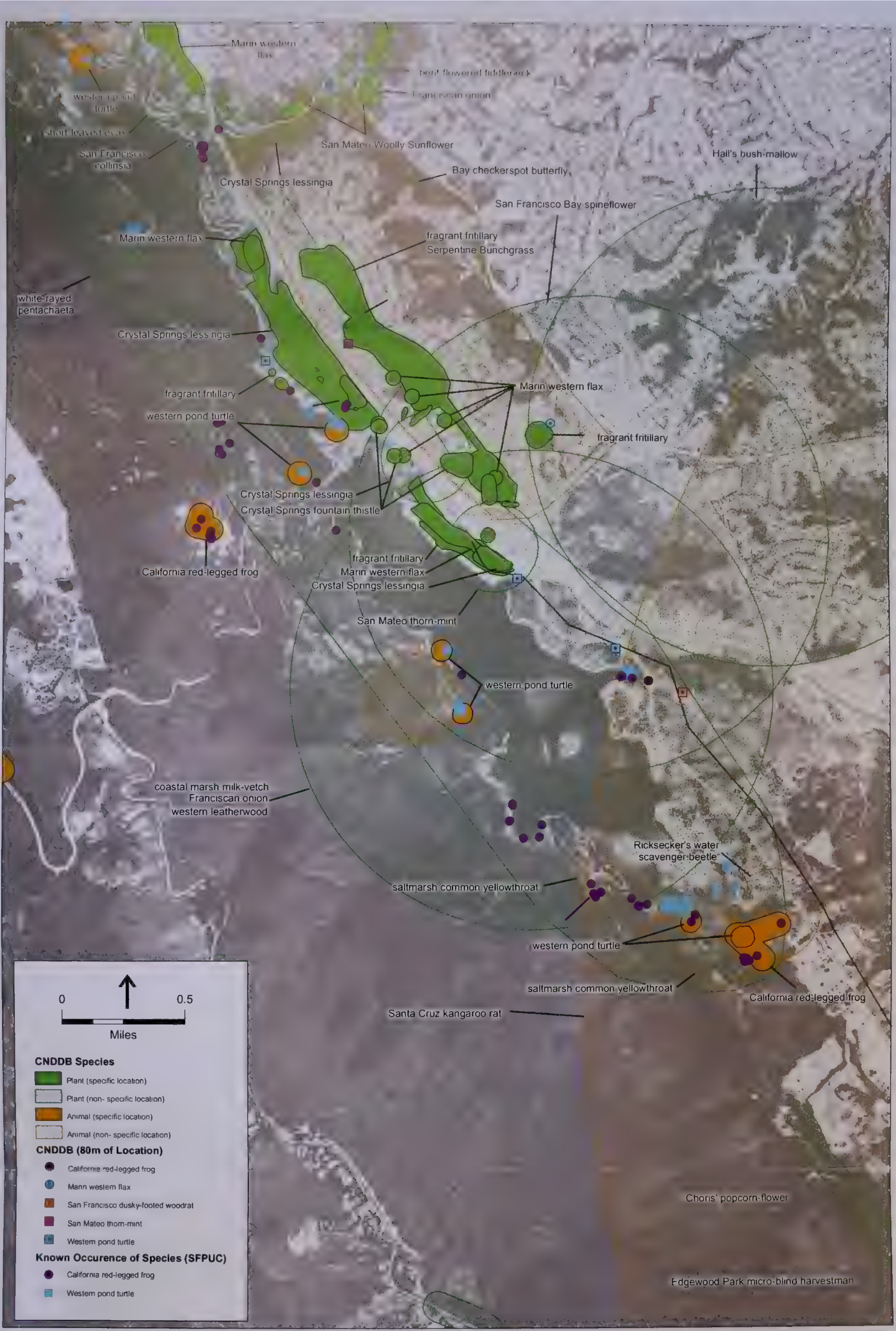


SOURCE: SFPUC, 2008; CDFG, 2009; DOA, 2005

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.13-2

Special-status Species Records for Peninsula Watershed South


Marin western flax
bent flowered fiddleneck
Franciscan onion
western pond turtle
short leaved evax
San Francisco collinsia
San Mateo Woolly Sunflower
Hall's bush-mallow
Crystal Springs lessingia
Bay checkerspot butterfly
San Francisco Bay spineflower
Marin western flax
fragrant fritillary
Serpentine Bunchgrass
white-rayed pentachaeta
Crystal Springs lessingia
fragrant fritillary
Marin western flax
western pond turtle
fragrant fritillary
Crystal Springs lessingia
Crystal Springs fountain thistle
California red-legged frog
fragrant fritillary
Marin western flax
Crystal Springs lessingia
San Mateo thorn-mint
western pond turtle
coastal marsh milk-vetch
Franciscan onion
western leatherwood
Ricksecker's water scavenger beetle
saltmarsh common yellowthroat
western pond turtle
saltmarsh common yellowthroat
California red-legged frog
Santa Cruz kangaroo rat
Choris' popcorn-flower
Edgewood Park micro-blind harvestman
0
0.5
Miles
CNDDB Species
Plant (specific location)
Plant (non- specific location)
Animal (specific location)
Animal (non- specific location)
CNDDB (80m of Location)
California red-legged frog
Marin western flax
San Francisco dusky-footed woodrat
San Mateo thorn-mint
Western pond turtle
Known Occurence of Species (SFPUC)
California red-legged frog
Western pond turtle

SOURCE: SFPUC, 2008; CDFG, 2009; DOA, 2005

Figure 5.13-2
Special-status Species Records for Peninsula Watershed South

of 26 species for which suitable habitat exists in the project area. This list includes species that are federally and state listed as endangered or threatened, 1 state-designated rare species, and 19 other special-status plant species. **Table 5.13-1** presents a summary of these plant species and an assessment of their potential to occur in the project area. The text following the table provides additional detail.

Species information was derived from the CNDDB (CDFG, 2009c), the CNPS Inventory (CNPS, 2001; CNPS, 2006), Munz and Keck (1968), and Hickman (1993). The listing status for each species was confirmed by the CDFG's Special Vascular Plants, Bryophytes, and Lichens list (CDFG, 2009a). Other sources are indicated where relevant.

Seven special-status plant species were observed during surveys of the project area in 2006. These species are fountain thistle (*Cirsium fontinale* var. *fontinale*), Marin western flax (*Hesperolinon congestum*), Franciscan onion (*Allium peninsulare* var. *franciscanum*), San Francisco collinsia (*Collinsia multicolor*), western leatherwood (*Dirca occidentalis*), Crystal Springs lessingia (*Lessingia arachnoidea*), and arcuate bush mallow (*Malacothamnus arcuatus* [=*M. fasciculatus*]). All surveyed populations are associated with woodland, scrub, or grassland communities adjacent to the ordinary high water line of both Upper and Lower Crystal Springs Reservoirs. The locations of the special-status plants detected during surveys conducted for this EIR are included in the *Biological Resources Technical Report* (Entrix, 2009, and Appendix I to this EIR). The following text provides natural history descriptions of the special-status plant species known to occur, or with a moderate or high potential to occur, in the project area.

San Mateo Thorn-mint

San Mateo thorn-mint is federally and state listed as endangered (Federal Register, 1995; CDFG, 2006a) and is categorized by the CNPS as a List 1B species. No critical habitat has been designated or proposed for San Mateo thorn-mint. This thorn-mint was known as *Acanthomintha obovata* var. *duttonii* when it was federally listed (Federal Register, 1995). This species is an annual herb found in chaparral, valley and foothill grasslands, and coastal scrub. Historically, San Mateo thorn-mint occurred in scattered populations from Woodside to Crystal Springs Reservoir (Federal Register, 1995). Extant populations are only known to occur on very uncommon serpentinite clays in relatively open areas. San Mateo thorn-mint is most commonly found at elevations ranging from 165 to 660 feet, blooming from April to June (CNPS, 2001). This species is known to occur in the vicinity of the project, near Interstate 280 (I-280) and Edgewood Road (GGNPA, 2001), but it was not observed in the project area during surveys in 2006.

Franciscan Onion

Franciscan onion (*Allium peninsulare* var. *franciscanum*), a CNPS List 1B species (CNPS, 2001, 2006), is a bulbiferous perennial herb. It is commonly associated with cismontane woodland as well as valley and foothill grassland habitats. Franciscan onion is often found on dry hillsides with clay soils or on serpentine outcrops. This herb blooms from May to June and generally occurs from 330 to 985 feet in elevation. This species is present in Sonoma, San Mateo, and Santa Clara Counties (CNPS, 2001). There is a potential for this herb to occur within the project area

TABLE 5.13-1
SPECIAL-STATUS PLANT SPECIES WITH POTENTIAL TO OCCUR IN THE PROJECT AREA

Common Name ***Scientific Name***	**Listing Status**	**Phenology**[a]	**Flowering Period**	**Habitat Conditions**	**Potential to Occur**
San Mateo thorn mint *Acanthomintha duttonii*	FE CE CNPS 1B.1	Annual herb	Apr – Jun	Chaparral, valley and foothill grassland, and coastal scrub. Extant populations only known from very uncommon serpentinite vertisol clays in relatively open areas. Elevation 165 to 660 feet.	High based on nearby historical records, but species not seen north of Edgewood Park in recent decades.
Franciscan onion *Allium peninsulare* var. *franciscanum*	CNPS 1B.2	Perennial herb (bulbiferous)	May – Jun	Cismontane woodland, and valley and foothill grassland. Clay soils, often on serpentine. Dry hillsides. Elevation 330 to 985 feet.	Known; present in several colonies at edges of Crystal Springs Reservoir.
Bent-flowered fiddleneck *Amsinckia lunaris*	CNPS 1B.2	Annual herb	Mar – Jun	Cismontane woodland, and valley and foothill grassland. Elevation 165 to 1,640 feet.	Moderate; nearby records and suitable woodland-grassland habitat present, but species not observed during field surveys.
Santa Cruz manzanita *Arctostaphylos andersonii*	CNPS 1B.2	Shrub (evergreen)	Nov – Apr	Broadleaved upland forest, chaparral, and north coast coniferous forest. Open sites, redwood forest. Elevation 590 to 2,625 feet.	Low; known range is west side of Santa Cruz Mountains; project area is out of species range.
Montara manzanita *Arctostaphylos montaraensis*	CNPS 1B.2	Shrub (evergreen)	Jan – Mar	Chaparral and coastal scrub. Slopes and ridges. Elevation 490 to 1,640 feet.	Low; all records are from Montara Mountain and San Bruno Mountain; project is slightly out of species known range.
Kings Mountain manzanita *Arctostaphylos regismontana*	CNPS 1B.2	Shrub (evergreen)	Jan – Apr	Broadleaved upland forest, chaparral, and north coast coniferous forest. Granitic or sandstone outcrops. Elevation 1,000 to 2,400 feet.	Low; species range is generally west of project area.
Coastal marsh milk-vetch (or brine milk-vetch) *Astragalus pycnostachyus* var. *pycnostachyus*	CNPS 1B.2	Perennial herb	Apr – Oct	Coastal dunes, coastal salt marshes. Mesic sites in dunes or along streams or coastal salt marshes. Elevation sea level to 98 feet.	Low; suitable habitat not present in project area.
Pappose tarplant *Centromadia* (or *Hemizonia*) *parryi* ssp. *parryi*	CNPS 1B.2	Annual herb	May/Jun – Nov	Coastal prairie, meadows and seeps, coastal salt marsh, valley and foothill grassland. Vernally mesic, often alkaline sites. Elevation 6 to 1,380 feet.	Low; suitable alkaline soil conditions not present.
San Francisco Bay spineflower *Chorizanthe cuspidata* var. *cuspidata*	CNPS 1B.2	Annual herb	Apr – Aug	Coastal bluff scrub, coastal dunes, coastal prairie, and coastal scrub. Closely related to *C. pungens*. Sandy soil on terraces and slopes. Elevation 15 to 1,805 feet.	Low; suitable soil conditions generally not present in project area.
Franciscan thistle *Cirsium andrewsii*	CNPS 1B.2	Perennial herb	Mar – Jul	Coastal bluff scrub, broadleaved upland forest, and coastal scrub. Sometimes serpentine seeps. Elevation sea level to 440 feet.	Low; presumed extirpated from San Mateo County.

TABLE 5.13-1 (Continued)
SPECIAL-STATUS PLANT SPECIES WITH POTENTIAL TO OCCUR IN THE PROJECT AREA

Common Name ***Scientific Name***	**Listing Status**	**Phenology**[a]	**Flowering Period**	**Habitat Conditions**	**Potential to Occur**
Fountain thistle *Cirsium fontinale* var. *fontinale*	FE CE CNPS 1B.1	Perennial herb	Jun – Oct	Valley and foothill grassland and chaparral. Serpentine seeps and grassland. Elevation 295 to 590 feet.	Known; present in moist serpentine near reservoir.
San Francisco collinsia *Collinsia multicolor*	CNPS 1B.2	Annual herb	Mar – May	Closed-cone coniferous forest and coastal scrub, on decomposed shale (mudstone) mixed with humus. Elevation 100 to 820 feet.	Known; observed on shady slopes near reservoir.
Point Reyes bird's-beak *Cordylanthus maritimus* ssp. *Palustris*	CNPS 1B.2	Annual herb, hemiparasitic	Jun – Oct	Coastal salt marsh, usually with *Salicornia, Distichlis, Jaumea, Spartina,* etc. Elevation sea level to 50 feet.	Low; salt marsh habitat not present.
Western leatherwood *Dirca occidentalis*	CNPS 1B.2	Shrub (deciduous)	Jan – Apr	Broadleaved upland forest, most woodland types. On brushy slopes, mesic sites; mostly in mixed evergreen and foothill woodland communities. Elevation 100 to 1,805 feet.	Known; present near reservoir edge and at Tracy Lake.
San Mateo woolly sunflower *Eriophyllum latilobum*	FE CE CNPS 1B.1	Perennial herb	May – Jun	Cismontane woodland, often on roadcuts; found on and off of serpentine. Elevation 150 to 490 feet.	High; present on Crystal Springs Road below dam, but not observed during field surveys.
Hillsborough chocolate lily (or Gray's fritillary) *Fritillaria biflora* var. *ineziana* (or *F. grayana*)	CNPS 1B.1	Perennial herb (bulbiferous)	Mar – Apr	Cismontane woodland, valley and foothill grassland, probably on serpentine grassland. Known only from the Hillsborough area. Elevation 295 to 525 feet.	Moderate; present on suitable habitat near reservoir, but not observed during field surveys.
Fragrant fritillary *Fritillaria liliacea*	CNPS 1B.2	Perennial herb (bulbiferous)	Feb – Apr	Coastal scrub, valley and foothill grassland, and coastal prairie. Often on serpentine; various soils reported, though usually clay. Elevation 10 to 1,345 feet.	Known from CNDDB record, "east bank of Lower Crystal Springs Reservoir"; not mapped during project field surveys.
San Francisco gumplant *Grindelia hirsutula* var. *Maritima*	CNPS 1B.2	Perennial herb (bulbiferous)	Aug – Sept	Coastal scrub, coastal bluff scrub, valley and foothill grassland. Sandy or serpentine slopes, sea bluffs. Elevation 50 to 1,310 feet.	Low; limited suitable habitat, and species not observed during field surveys.
Marin western flax *Hesperolinon congestum*	FT CT CNPS 1B.1	Annual herb	Apr – Jul	Chaparral, valley and foothill grassland. In serpentine barrens, and in serpentine grassland and chaparral. Elevation 100 to 1,200 feet.	Known; observed at reservoir edge in four localities.
Point Reyes horkelia *Horkelia marinensis*	CNPS 1B.2	Perennial herb	May – Sept	Coastal dunes, coastal prairie, coastal scrub. Sandy flats and dunes near coast; in grassland or scrub plant communities. Known from fewer than 20 occurrences. Elevation 15 to 100 feet.	Low; species found on immediate coast, and suitable sandy soils not present in project area.

TABLE 5.13-1 (Continued)
SPECIAL-STATUS PLANT SPECIES WITH POTENTIAL TO OCCUR IN THE PROJECT AREA

Common Name *Scientific Name*	Listing Status	Phenology^{a}	Flowering Period	Habitat Conditions	Potential to Occur
Coast yellow leptosiphon, coast yellow linanthus *Leptosiphon* (or *Linanthus*) *croceus*	CNPS 1B.1	Annual herb	May	Coastal bluff scrub and coastal prairie. Elevation 30 to 490 feet.	Low; suitable coastal habitat not present in project area.
Rose leptosiphon, rose linanthus *Leptosiphon*(or *Linanthus*) *rosaceus*	CNPS 1B.1	Annual herb	Apr – Jun	Coastal bluff scrub. Elevation sea level to 330 feet.	Low; suitable coastal habitat not present in project area.
Crystal Springs lessingia *Lessingia arachnoidea*	CNPS 1B.2	Annual herb	Jul – Oct	Coastal sage scrub, valley and foothill grassland, cismontane woodland. Grassy slopes on serpentine; sometimes on roadsides. Elevation 200 to 655 feet.	Known; present in serpentine grasslands on eastern side of Upper Crystal Springs Reservoir.
Arcuate bush mallow *Malacothamnus arcuatus* (or *M. fasciculatus*)	CNPS 1B.2	Shrub (evergreen)	Apr – Sept	Chaparral on gravelly alluvium. Elevation 260 to 1,165 feet.	Known from several small colonies at edge of Crystal Springs Reservoir.
Dudley's lousewort *Pedicularis dudleyi*	CR CNPS 1B.2	Perennial herb	Apr – Jun	Chaparral (maritime) cismontane woodland, north coast coniferous forest, and valley and foothill grassland. In deep shady woods of older coast redwood forests. Elevation 200 to 2,950 feet.	Moderate; deep shady forest limited in project area and not observed during field surveys.
White-rayed pentachaeta *Pentachaeta bellidiflora*	FE CE CNPS 1B.1	Annual herb	Mar – May	Valley and foothill grassland. Open dry rocky slopes and grassy areas, often on soils derived from serpentine bedrock. Elevation 115 to 2,035 feet.	High; historical records from Pulgas Ridge, but no recent records in vicinity and not observed in field surveys.
Choris's popcorn-flower *Plagiobothrys chorisianus* var. *chorisianus*	CNPS 1B.2	Annual herb	Mar – Jun	Chaparral, coastal scrub and coastal prairie; mesic sites. Elevation 50 to 330 feet.	Low; historical records near Pulgas Water Temple, and suitable habitat may be present in wetlands, but not observed during field surveys.
Hickman's cinquefoil, Hickman's potentilla *Potentilla hickmanii*	FE CE CNPS 1B.1	Perennial herb (bulbiferous)	Apr – Aug	Coastal bluff scrub, closed-cone coniferous forest, meadows and seeps, marshes and swamps. Freshwater marshes, seeps, and small streams in open or forested areas along the coast. Elevation 15 to 405 feet.	Low; known range is coastal, and project area is apparently out of species range.
Mission Dolores (or San Francisco) campion *Silene verecunda* ssp. *Verecunda*	CNPS 1B.2	Perennial herb (bulbiferous)	Mar – Aug	Coastal scrub, valley and foothill grassland, coastal bluff scrub, chaparral, and coastal prairie. Often on mudstone or shale; rarely on serpentine. Elevation 100 to 2,115 feet.	Low; suitable habitat may be present in project area, but species not observed during field surveys.

TABLE 5.13-1 (Continued)
SPECIAL-STATUS PLANT SPECIES WITH POTENTIAL TO OCCUR IN THE PROJECT AREA

Common Name *Scientific Name*	**Listing Status**	**Phenology**[a]	**Flowering Period**	**Habitat Conditions**	**Potential to Occur**
Water sack (or saline) clover *Trifolium depauperatum* var. *hydrophilum*	CNPS 1B.2	Annual herb	Apr – Jun	Marshes and swamps, valley and foothill grassland, and vernal pools. Mesic, alkaline sites. Elevation sea level to 985 feet.	Low; suitable alkaline conditions not present in project area.
San Francisco owl's clover *Triphysaria floribunda*	CNPS 1B.2	Annual herb	Apr – Jun	Coastal prairie, coastal scrub, valley and foothill grassland. On serpentine and non-serpentine substrate. Elevation 35 to 525 feet.	Low; nearest records from near San Andreas Lake; suitable habitat may be present but species not observed during field surveys.
Caper fruited tropidocarpum *Tropidocarpum capparideum*	CNPS 1B.1	Annual herb	Mar – Apr	Valley foothill grassland, alkaline hills, alkaline clay. Last seen in 1957, then rediscovered at Fort Hunter Liggett. Elevation sea level to 1,490 feet.	Low; suitable alkaline habitat not present in project area.

NOTES:

[a] Phenology is the study of periodic occurrences in nature, such as the migration of birds and the ripening of fruit, and their relation to climate.

CODES

FE: Federally listed as Endangered
FT: Federally listed as Threatened
CE: State of California listed as Endangered
CT: State of California listed as Threatened
CR: State of California listed as Rare

CNPS = California Native Plant Society
1A: Presumed extinct in California
1B: Rare, Threatened, or Endangered in California and elsewhere
2: Rare, Threatened, or Endangered in California, but more common elsewhere
3: Plants about which more information is needed – a review list
4: Plants of limited distribution – a watch list

POTENTIAL TO OCCUR

Low = Habitat not present in the project area and/or few occurrences in the region.
Moderate = Marginal habitat present in the project area and/or some occurrences in the region.
High = Good habitat present in the project area and/or nearby occurrences.
Known = Species is known to occur in the project area based on CNDDB occurrences or recent field surveys.

SOURCES: CDFG, 2006a; CDFG, 2006b; CNPS, 2001; CNPS, 2006; CalFlora, 2005.

based on available habitat, including serpentine outcrops and dry hillsides with clay soils. This species was observed at five locations during project surveys in 2006, occupying a total area of 0.02 acre of grassland and woodland in the project area. More than 216 individuals were observed at these locations.

Bent-Flowered Fiddleneck

Bent-flowered fiddleneck (*Amsinckia lunaris*) is an annual herb blooming from March to June, from 165 to 1,640 feet in elevation. This CNPS List 1B species (CNPS, 2001, 2006) is found in cismontane woodland as well as in valley and foothill grassland. This fiddleneck occurs from Santa Cruz and Alameda Counties north to Marin, Lake, and Colusa Counties, and possibly as far north as Shasta or Siskiyou County (CNPS, 2001). Coast live oak woodland and non-native grassland within the project area provide suitable habitat for this species, but it was not observed during surveys in 2006.

Fountain Thistle

Fountain thistle (*Cirsium fontinale* var. *fontinale*) is a perennial herb that is federally and state listed as endangered (CDFG, 2009a) and is categorized by the CNPS as a List 1B species (CNPS, 2001, 2006). No critical habitat has been designated or proposed for fountain thistle. Blooming from June to October, the species is known to occur in valley and foothill grassland and chaparral. It is also commonly found in serpentine seeps and grasslands from 295 to 590 feet in elevation. Historically, fountain thistle occurred in San Mateo and Santa Clara Counties, but it is now limited to San Mateo County (Federal Register, 1995). Fountain thistle was found at two locations within the project area in 2006. When assessed in late 2009, 0.56 acres of Crystal Springs fountain thistle were present at elevations up to 291.8 feet, and of this, 0.30 acres were within the future operational area (up to 287.8 feet).

San Francisco Collinsia

San Francisco collinsia (*Collinsia multicolor*) is an annual herb that blooms from March through May and is categorized by the CNPS as a List 1B species (CNPS, 2001; 2006). This species is common in closed-cone coniferous forest and coastal scrub and is often found on decomposed shale (mudstone) mixed with humus. It can be found at elevations ranging from 100 to 820 feet. This collinsia species occurs from San Francisco County south to Monterey County (CNPS, 2001). San Francisco collinsia was observed at three locations during surveys of the project area in 2006, occupying a total area of 0.01 acre. Approximately 620 plants were observed at these locations.

Western Leatherwood

Western leatherwood (*Dirca occidentalis*) is a deciduous shrub occurring in broadleaved upland forest, chaparral, closed-cone coniferous forest, cismontane woodland, north coast coniferous forest, riparian forest, and riparian woodland habitat types. This shrub, categorized as a CNPS List 1B species, blooms from January to April (CNPS, 2001, 2006) and is often found on mesic sites and brushy slopes, mostly in mixed evergreen and foothill woodland communities from

100 to 1,805 feet in elevation. This shrub occurs from south of Sonoma County to San Mateo and Santa Clara Counties (CNPS, 2001). Western leatherwood was observed at three locations during surveys of the project area in 2006, occupying a total area of 0.09 acre. Twenty-eight plants were observed at these locations.

San Mateo Woolly Sunflower

San Mateo woolly sunflower (*Eriophyllum latilobum*) is federally and state listed as endangered (CDFG, 2009a) and is a CNPS List 1B species (CNPS, 2001, 2006). No critical habitat has been designated or proposed for San Mateo woolly sunflower. This perennial herb blooms from May to June (CNPS, 2001) and commonly occurs in oak woodland. Often located on roadcuts as well as on and off serpentine outcroppings at elevations from 150 to 490 feet, this species is restricted to San Mateo County and is known to occur within one mile of the project area. However, it was not observed in the project area during surveys in 2006.

Hillsborough Chocolate Lily

Hillsborough chocolate lily (*Fritillaria biflora* var. *ineziana*) is a bulbiferous perennial herb that blooms from March to April and is a CNPS List 1B species (CNPS, 2001, 2006) known to be present only in the Hillsborough area. This lily species is common in cismontane woodland and valley and foothill grassland at elevations ranging from 295 to 525 feet and is also occasionally associated with serpentine grassland. Although there is suitable habitat for this species in the project area, the species was not observed during surveys in 2006.

Fragrant Fritillary

The fragrant fritillary (*Fritillaria liliacea*), a CNPS List 1B species (CNPS, 2001, 2006), is a bulbiferous perennial herb that blooms from February to April in habitat such as coastal scrub, valley and foothill grassland, and coastal prairies. This species is often found on serpentine outcrops and primarily on clay soils, although a variety of other soil types also support the species. Fragrant fritillary is found from Sonoma and Solano Counties south to Monterey and San Benito Counties (CNPS, 2001). Fragrant fritillary has an elevation range of 10 to 1,345 feet, and occurrences of this species have been recorded directly adjacent to Upper Crystal Springs Reservoir (GGNPA, 2001). Grassland communities within the project area provide suitable habitat for this species, but it was not observed during surveys in 2006.

Marin Western Flax

Marin western flax (*Hesperolinon congestum,* also known as Marin dwarf flax) is both federally and state listed as threatened (CDFG, 2009a) and is categorized as a CNPS List 1B species (CNPS, 2001, 2006). No critical habitat has been designated or proposed for Marin western flax. This species is an annual herb blooming from April through July, in chaparral, valley grassland, and foothill grassland habitats. Marin western flax is commonly found in serpentine barrens and in serpentine grassland and chaparral, from 100 to 1,200 feet in elevation. Marin western flax occurs from Marin County to San Mateo County (Federal Register, 1995), and there are several known occurrences of this species within the project area (GGNPA, 2001). Marin western flax was observed in serpentine grasslands at four locations during project surveys in 2006, occupying a total area of 0.02 acre in the project area. More than 640 individuals were observed at these locations, with most above the 290-foot elevation.

Crystal Springs Lessingia

Crystal Springs lessingia (*Lessingia arachnoidea*), a CNPS List 1B species (CNPS, 2001, 2006), is an annual herb blooming from July to October within habitats of coastal sage scrub, valley and foothill grassland, and cismontane woodland. This species has an elevation range of 200 to 655 feet and is often associated with grassy slopes on serpentine, and occasionally along roadsides. This species is found in Sonoma and San Mateo Counties (CNPS, 2001). Approximately 5,800 Crystal Springs lessingia plants were observed at nine locations during surveys of the project area in 2006, occupying a total area of 5.7 acres. Several of these colonies continued upslope, occupying extensive areas outside of the project area. Crystal Springs lessingia also occurs in the grasslands and shoreline of Staging Area 9 near the Boat Ramp and along the access road from Skyline Boulevard.

Arcuate Bush Mallow

Arcuate bush mallow (*Malacothamnus arcuatus* [=*M. fasciculatus*]), a CNPS List 1B species (CNPS, 2001, 2006), is an evergreen shrub. The species blooms from April to September, generally occurring in chaparral communities and primarily on gravelly alluvium at elevations from 260 to 1,165 feet. This species occurs in San Mateo, Santa Cruz, and Santa Clara Counties (CNPS, 2001). Arcuate bush mallow was observed at three locations during surveys of the project area in 2006, occupying a total area of 85 square feet. Eight bush mallow plants were observed at these locations.

Dudley's Lousewort

Dudley's lousewort (*Pedicularis dudleyi*) is a California state rare species (CDFG, 2009a) and CNPS List 1B species (CNPS, 2001, 2006). A perennial herb blooming from April to June, the species is often found in deep shady woods of older coast redwood forests. Common habitats include chaparral (maritime), cismontane woodland, north coast coniferous forest, and valley and foothill grassland from 200 to 2,950 feet. This species historically occurred from San Mateo County to San Luis Obispo County, but it may have been extirpated from Santa Cruz County (CNPS, 2001). There is potential for this species to be present in grassland and woodland habitats within the project area, but it was not observed during surveys in 2006.

White-Rayed Pentachaeta

The white-rayed pentachaeta (*Pentachaeta bellidiflora*) is federally and state listed as endangered (CDFG, 2009a) and is a CNPS List 1B species (CNPS, 2001, 2006). No critical habitat has been designated or proposed for white-rayed pentachaeta. An annual herb that blooms from March to May in valley and foothill grasslands, this species is often present in open, dry, rocky slopes and grassy areas, often on soils derived from serpentine bedrock. This species is found at elevations ranging from 115 to 2,035 feet. White-rayed pentachaeta historically occurred in Marin, San Mateo, and Santa Cruz Counties, but is now found only in San Mateo County (Federal Register, 1995). Although there is suitable habitat in grasslands and serpentine soils, white-rayed pentachaeta was not observed during surveys in 2006.

Special-Status Terrestrial Wildlife Species

Special-status terrestrial wildlife species that could be present in the project area include 39 species, of which 10 are federally listed (see **Table 5.13-2**). The text below and following the table provides additional detail.

San Bruno Elfin Butterfly

San Bruno elfin butterfly (*Callophrys mossii bayensis*) is federally listed as endangered (Federal Register, 1976). This species inhabits rocky outcrops and cliffs in coastal scrub on the Peninsula. Its patchy distribution reflects that of its host plant, Pacific stonecrop (*Sedum spathulifolium*). Adults of this butterfly species emerge in early spring (February and March), when flowers that provide their nectar diet begin to open. The butterflies mate soon thereafter, and the female must locate appropriate host plants on which to deposit her eggs. The eggs typically hatch within a week. The tiny larvae first feed on the plant's vegetative structures. However, when the stonecrop's flowers begin to open, the larvae migrate upward and feed on the flowers themselves. By June, most have completed their larval development, at which time they leave the host plant to pupate in ground litter. They lie dormant as pupae until the following spring, when the cycle begins again (Essig Museum, 2006).

San Bruno elfin butterfly is restricted to a few small populations, the largest of which occurs on San Bruno Mountain. Quarrying, off-road recreation, and urban development have diminished its habitat, and development pressures on the Peninsula continue to grow (Essig Museum, 2006). The nearest recorded location of this butterfly to the project area is one-half mile to the northwest (Arnold, 2007-2009).

Pacific stonecrop, a host plant to the larvae of San Bruno elfin butterfly, is a perennial herb with a preferred habitat of rocky places in coniferous and mixed evergreen forests, below 7,500 feet in elevation. There is suitable habitat for Pacific stonecrop in mixed evergreen forest on the western shore of Lower Crystal Springs Reservoir, but it was not observed during surveys in 2006.

Critical habitat was proposed for San Bruno elfin butterfly on February 8, 1977 (Federal Register, 1977), but a final determination on critical habitat for this species has not been made. Proposed critical habitat for this butterfly is outside of the project area, in the San Bruno Mountains to the north of the project area.

TABLE 5.13-2
SPECIAL-STATUS WILDLIFE SPECIES WITH POTENTIAL TO OCCUR IN THE PROJECT AREA

Common Name *Scientific Name*	**Status**	**Habitat**	**Potential to Occur**
INVERTEBRATES			
Edgewood blind harvestman *Calicina (=Sitalcina) minor*	SA	Open grassland in xeric environments. Found beneath serpentine rocks in grassland adjacent to scrub oaks.	Limited potential to occur. Some stands of oak woodland are adjacent to serpentine areas, with grasslands on the east shores of the reservoirs.
San Bruno elfin butterfly *Callophrys mossii bayensis*	FE	Coastal, mountainous areas with grassy ground cover, mainly in the vicinity of San Bruno Mountain, San Mateo County. Colonies are located on steep, north-facing slopes within the fog belt. Larval host plant is *Sedum spathulifolium.*	No plants of *Sedum spathulifolium* were found in the project area during surveys in 2006. This species is not expected to occur.
Monarch butterfly *Danaus plexippus*	SA	Winter roost sites extend along the coast from northern Mendocino to Baja California, Mexico. Roosts located in wind-protected tree groves (eucalyptus, Monterey pine, cypress), with nectar and water sources nearby.	Unlikely to occur. Potential winter roost trees are present in the project area, but no winter roosts have been reported.
Bay checkerspot butterfly *Euphydryas editha bayensis*	FT	Restricted to native grasslands on outcrops of serpentine soil in the vicinity of San Francisco Bay. *Plantago erecta* is the primary host plant; *Orthocarpus densiflorus* and *O. exserta* are the secondary host plants.	*Plantago erecta* and *Orthocarpus* plants were found in the project area during surveys in 2006, but only in small colonies. The species has a colonial type of population structure, requiring a minimum of dozens of contiguous grassland acres and food plants to support even a small population of the butterfly. Thus despite historical occurrences in the general area, suitable habitat was not observed in the project area itself.
Ricksecker's water scavenger beetle *Hydrochara rickseckeri*	SA	Aquatic.	One collection from the vicinity of the Pulgas Water Temple.
San Francisco forktail damselfly *Ischnura gemina*	SA	Endemic to the San Francisco Bay area. Small, marshy ponds and ditches with emergent and floating aquatic vegetation.	Limited habitat may be available at Tracy Lake.
Bumblebee scarab beetle *Lichnanthe ursina*	SA	Inhabits coastal sand dunes from Sonoma County south to San Mateo County. Usually flies close to sand surface near the crest of the dunes.	No potential to occur, as suitable habitat is not present.
Edgewood Park micro-blind harvestman *Microcina edgewoodensis*	SA	Open grassland in areas of serpentine bedrock. Found on the underside of moist serpentine rocks near permanent springs.	Unlikely to occur. Although there is grassland on serpentine in the project area, it is not associated with permanent springs.
San Francisco lacewing *Nothochrysa californica*	SA	Woodland, riparian, and scrub in the Coast Ranges from Mendocino to Los Angeles Counties.	Unknown potential to occur.
Mission blue butterfly *Plebejus icarioides missionensis*	FE	Inhabits grasslands of the San Francisco Peninsula. Three larval host plants: *Lupinus albifrons, L. variicolor,* and *L. formosus,* of which *L. albifrons* is favored.	Unlikely to occur. Limited host plants detected.

TABLE 5.13-2 (Continued)
SPECIAL-STATUS WILDLIFE SPECIES WITH POTENTIAL TO OCCUR IN THE PROJECT AREA

Common Name ***Scientific Name***	**Status**	**Habitat**	**Potential to Occur**
INVERTEBRATES (cont.)			
Myrtle's silverspot butterfly *Speyeria zerene myrtleae*	FE	Restricted to the foggy, coastal dunes/hills of the Point Reyes Peninsula; extirpated from coastal San Mateo County. Larval foodplant thought to be *Viola adunca*.	Unlikely to occur. No host plants detected.
FISH			
Steelhead (Central California Coast DPS) *Oncorhynchus mykiss*	FE	Coldwater streams tributary to the ocean.	Occurs in the San Mateo Creek watershed downstream from Lower Crystal Springs Dam.
AMPHIBIANS			
California tiger salamander *Ambystoma californiense*	FT, CP	California endemic, a lowland species restricted to the grasslands and lowest foothill regions of central and northern California. Breeding habitats are vernal pools or other seasonal wetlands. During the dry season, tiger salamanders travel up to 1.6 kilometers to find small mammal burrows, which it uses as aestivation habitat.	Unlikely to occur. The reservoir and seasonal wetlands in the project area do not provide suitable breeding habitat. None were detected during aquatic surveys on the watershed. The project area is a few miles north of the nearest known historical population in San Mateo County.
California red-legged frog *Rana draytonii*	FT, CSC	Lowlands and foothills in or near permanent sources of deep water with dense, shrubby, or emergent riparian vegetation. Requires 11–20 weeks of permanent water for larval development; must have access to aestivation habitat.	Known to occur in the project area on the periphery of Lower Crystal Springs Reservoir, in an artificial pond on the dam parapet, in San Mateo Creek below the dam, and at Sampling Station #5.
Foothill yellow-legged frog *Rana boylii*	CSC	Partly shaded, low-gradient streams and riffles with a rocky substrate in a variety of habitats. Needs at least some cobble-sized substrate for egg-laying. Needs at least 15 weeks to attain metamorphosis.	Unlikely to occur. Historically the species occurred in the watershed, and small portions of the project area hold marginal habitat, but the habitat is degraded or unsuitable and surveys have not documented species presence.
REPTILES			
Northwestern pond turtle *Clemmys marmorata marmorata*	CSC	Thoroughly aquatic: found in ponds, marshes, rivers, streams, and irrigation ditches with aquatic vegetation. Needs basking sites and suitable (sandy banks or grassy open fields) upland habitat for egg-laying.	Known to occur. Suitable habitat abundant within project area, and western pond turtles were observed during project wildlife surveys.
Southwestern pond turtle *Clemmys marmorata pallida*	CSC	Inhabits permanent or nearly permanent bodies of water in many habitat types below 6,000 feet in elevation. Requires basking sites such as partially submerged logs, vegetation mats, or open mud banks. Needs suitable nesting sites.	Known to occur. Suitable habitat abundant within project area, and western pond turtles were observed during project wildlife surveys.
California horned lizard *Phrynosoma coronatum frontale*	CSC	Frequents a wide variety of habitats, most common in lowlands along sandy washes with scattered low bushes. Open areas for sunning, bushes for cover, patches of loose soil for burial, and abundant supply of ants and other insects.	Unlikely to occur. Open spaces for sunning and loose soil along project shoreline provide suitable habitat for this species, but none were seen during surveys.

TABLE 5.13-2 (Continued)
SPECIAL-STATUS WILDLIFE SPECIES WITH POTENTIAL TO OCCUR IN THE PROJECT AREA

Common Name ***Scientific Name***	**Status**	**Habitat**	**Potential to Occur**
REPTILES (cont.)			
San Francisco garter snake *Thamnophis sirtalis tetrataenia*	FE, CE, FPS	Vicinity of freshwater marshes, ponds, and slow-moving streams in San Mateo County and extreme northern Santa Cruz County. Prefers dense cover and water depths of at least 1 foot. Upland areas near water also very important.	Known to occur in the project area on the periphery of Lower Crystal Springs Reservoir, in San Mateo Creek below the dam, and at Sampling Station #5.
BIRDS			
Tricolored blackbird *Agelaius tricolor*	CSC	(Nesting colony) Highly colonial species, most numerous in Central Valley and vicinity; largely endemic to California. Requires open water, protected nesting substrate, and foraging area with insect prey within a few kilometers of the colony.	Known to occur. Observed during project wildlife survey.
Bell's sage sparrow *Amphispiza belli belli*	CSC	(Nesting) Nests in chaparral dominated by fairly dense stands of chamise. Found in coastal sage scrub in south of range. Nests located on the ground beneath a shrub or in a shrub 6 to 18 inches above ground. Territories about 50 yards apart	May occur. Suitable nesting habitat is present in the project area.
Western burrowing owl *Athene cunicularia hypugaea*	CSC	Found in a wide variety of arid and semi-arid environments. Nesting habitat consists of open areas with mammal burrows, ranging from native prairie to urban habitats. Burrows need to be located in well-drained, level to gently sloping areas characterized by sparse vegetation and bare ground.	Unlikely to occur. Small mammal burrows are present in the project vicinity, but only marginal habitat is present in the project area due to the proximity to standing water and severity of slope.
Marbled murrelet *Brachyramphus marmoratus*	FT, CE	(Nesting) Feeds near shore on fish; nests along coast in California, from Half Moon Bay to Santa Cruz and from Eureka to the Oregon border. Nests high in old-growth redwood-dominated forests, up to six miles inland, often in Douglas firs.	May occur. Potential nesting habitat is located near the project area, but these sites lie on the border of this species' known range. Possible foraging habitat is present in the project vicinity.
Ferruginous hawk *Buteo regalis*	CSC	(Wintering) Open grasslands, sagebrush flats, desert scrub, low foothills, and fringes of pinyon-juniper. Habitats with abundant small mammals.	May occur. Suitable foraging habitat is present in the project vicinity.
Vaux's swift *Chaetura vauxi*	CSC	(Nesting) Natural cavities with vertical entranceways, such as hollow trees. (Foraging) Open sky over woodlands, lakes, and rivers where flying insects are abundant. Nesting habitat is forest, either coniferous or mixed, but primarily old growth with snags for nesting and roosting.	Known to occur. Observed during project wildlife survey.
Western snowy plover *Charadrius alexandrinus nivosus*	FT, CSC	(Nesting) Federal listing applies only to the Pacific coastal population. Sandy beaches, salt pond levees, and shores of large alkali lakes, needs sandy gravelly, or friable soils for nesting.	Unlikely to occur. Although there are known populations in the region, habitat in the project area is marginal at best.

TABLE 5.13-2 (Continued)
SPECIAL-STATUS WILDLIFE SPECIES WITH POTENTIAL TO OCCUR IN THE PROJECT AREA

Common Name ***Scientific Name***	**Status**	**Habitat**	**Potential to Occur**
BIRDS (cont.)			
Black swift *Cypseloides niger*	CSC	(Nesting) Coastal belt of Santa Cruz and Monterey Counties, central and southern Sierra Nevada; San Bernardino and San Jacinto Mountains. Breeds in small colonies on cliffs behind or adjacent to waterfalls in deep canyons and sea-bluffs above surf; forages widely.	Unlikely to occur. Possible foraging area in project vicinity; however, no suitable nesting habitat in the area.
White-tailed kite *Elanus leucurus*	FPS	Forages in undisturbed, open grasslands, meadows, farmlands, and emergent wetlands.	Known to occur.
Merlin *Falco columbarius*	CSC	A winter migrant in California. This species winters in a variety of habitats from the coast to grasslands, savannahs, woodlands, and open forests in the mountains, but it prefers open habitats near water.	Known to occur; unlikely to nest.
American peregrine falcon *Falco peregrinus anatum*	FD, CE	(Nesting) Near wetlands, lakes, rivers, or other water; on cliffs, banks, dunes, mounds; also, human-made structures. Nest consists of a scrape on a depression or ledge in an open site.	Unlikely to occur. No nesting habitat within the expected inundation zone; however, suitable foraging resources are present in the project area.
Salt marsh common yellowthroat *Geothlypis trichas sinuosa*	CSC	Resident of the San Francisco Bay region, in freshwater and saltwater marshes. Requires thick, continuous cover down to water surface for foraging, tall grasses, tule patches, willows for nesting.	Known to occur. Observed during project wildlife survey.
Bald eagle *Haliaeetus leucocephalus*	FD, CE	(Nesting and wintering) Ocean shore, lake margins, and rivers for both nesting and wintering. Most nests within 1 mile of water. Roosts communally in winter. Nests in large, old-growth, or dominant live tree with open branches, especially ponderosa pine.	Unlikely to occur. Marginal foraging habitat is present in the project area.
Harlequin duck *Histrionicus histrionicus*	CSC	(Nesting) Breeds on west slope of the Sierra Nevada, nesting along shores of swift, shallow rivers. Nest often built in recess, sheltered overhead by stream bank, rocks, woody debris, usually within 7 feet of water.	Unlikely to occur. No suitable habitat found within the project vicinity.
Loggerhead shrike *Lanius ludovicianus*	CSC	(Nesting) Broken woodlands, savannah, pinyon-juniper, Joshua tree, and riparian woodlands, desert oases, scrub, and washes. Prefers open country for hunting, with perches for scanning, and fairly dense shrubs and brush for nesting	May occur. Riparian woodlands located within the project area provide suitable nesting habitat.
California black rail *Laterallus jamaicensis coturniculus*	CT	Mainly inhabits salt marshes bordering large bays. Occurs in tidal salt marsh with pickleweed; also in freshwater and brackish marshes, all at low elevation.	May occur. Freshwater marshes are present in the project area, which is near to the large saltwater marshes of San Francisco Bay.

TABLE 5.13-2 (Continued)
SPECIAL-STATUS WILDLIFE SPECIES WITH POTENTIAL TO OCCUR IN THE PROJECT AREA

Common Name ***Scientific Name***	**Status**	**Habitat**	**Potential to Occur**
BIRDS (cont.)			
Alameda song sparrow *Melospiza melodia pusillula*	CSC	Resident of salt marshes bordering south arm of San Francisco Bay. Inhabits *Salicornia* marshes; nests low in *Grindelia* bushes (high enough to escape high tides) and in *Salicornia*.	Unlikely to occur. The project area does not provide suitable habitat for the species.
Long-billed curlew *Numenius americanus*	CSC	(Nesting) Breeds in upland shortgrass prairies and wet meadows in northeastern California. Habitats on gravelly soils and gently rolling terrain are favored over others.	May occur. Project area is outside the nesting range of the species, but marginal winter foraging habitat is present.
Double-crested cormorant *Phalacrocorax auritus*	CSC	(Rookery site) Colonial nester on coastal cliffs, offshore islands, and along lake margins in the interior of the state. Nests along coast on sequestered islets, usually on ground with sloping surface, or in tall trees along lake margins.	Known to occur. Observed during project wildlife survey. Suitable nesting habitat present in project area.
California clapper rail *Rallus longirostris obsoletus*	FE, CE	Saltwater and brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay. Associated with abundant growths of pickleweed, but feeds away from cover on invertebrates from mud-bottomed sloughs.	Unlikely to occur. Project area does not provide suitable foraging habitat.
Bank swallow *Riparia riparia*	CT	(Nesting) Colonial nester; nests primarily in riparian and other lowland habitats west of the desert. Requires vertical banks/cliffs with fine-textured/sandy soils near streams, rivers, lakes, ocean to dig nesting hole.	May occur. Potential nesting habitat observed in project vicinity.
California least tern *Sterna antillarum browni*	FE, CE	(Nesting colony) Nests along the coast from San Francisco Bay south to northern Baja California.	May occur. Project area found within species' known range, and may provide marginal foraging habitat.
Cooper's hawk *Accipiter cooperii*	CSC	Appears in most wooded areas of the state. Requires dense stands of live oak, riparian deciduous or other forest habitats near water when nesting.	May occur. Project area contains suitable habitat and foraging resources.
Little willow flycatcher *Empidonax traillii brewsteri*	CE	Prefers moist shrubby areas that often include standing or running water. Habitat includes thickets of willows, along streams in broad valleys, in canyon bottoms, around mountain seepages, or at the margins of ponds and lakes.	Unlikely to occur. Project area is outside the reported range of this species.
Osprey *Pandion haliaetus*	CSC	Occurs in ponderosa pine and mixed conifer habitats along seacoasts, lakes, and rivers. Foraging areas require large snags and open trees near large, clear, open waters.	Likely to occur. Project area is near osprey habitat, and reservoir has high potential for osprey foraging.
MAMMALS			
Pacific western big-eared bat *Corynorhuinus (=Plecotus) townsendii townsendii*	CSC	Humid coastal regions of northern and central California. Roosts in limestone caves, lava tubes, mines, buildings, etc. Will only roost in the open, hanging from walls and ceilings. Roosting sites limiting. Extremely sensitive to disturbance.	May occur. Anthropogenic features may serve as roosting habitat. Abundant foraging habitat is present in the project area.

TABLE 5.13-2 (Continued)
SPECIAL-STATUS WILDLIFE SPECIES WITH POTENTIAL TO OCCUR IN THE PROJECT AREA

Common Name ***Scientific Name***	**Status**	**Habitat**	**Potential to Occur**
		MAMMALS (cont.)	
Santa Cruz kangaroo rat *Dipodomys venustus venustus*	CSC	Silverleaf manzanita mixed chaparral in the Zayante Sand Hills ecosystem of the Santa Cruz Mountains. Needs soft, well-drained sand.	Unlikely to occur. Chaparral habitat in the project area is poor/marginal and shoreline is primarily rocky along the project area.
Greater western mastiff bat *Eumops perotis californicus*	CSC	Many open, semi-arid to arid habitats, including conifer and deciduous woodlands, coastal scrub, grasslands, chaparral, etc. Roosts in crevices in cliff faces, high buildings, trees, and tunnels.	May occur. Anthropogenic features may serve as roosting habitat. Abundant foraging habitat present
San Francisco dusky-footed woodrat *Neotoma fuscipes annectens*	CSC	Forest habitats of moderate canopy and moderate to dense understory. May prefer chaparral and redwood habitats. Constructs nests of shredded grass, leaves, and other material. May be limited by availability of nest-building materials.	Likely to occur. Woodrat nests observed during project wildlife survey.
Big free-tailed bat *Nyctinomops macrotis*	CSC	Low-lying arid areas in southern California. Needs high cliffs or rocky outcrops for roosting sites. Feeds principally on large moths.	Unlikely to occur. Suitable foraging habitat is present, but project area located outside the normal range for this species.
Salt marsh harvest mouse *Reithrodontomys raviventris*	FE, CE, FPS	Only in the saline emergent wetlands of San Francisco Bay and its tributaries. Pickleweed is primary habitat. Does not burrow, builds loosely organized nests. Requires higher areas for flood escape.	No potential to occur. Project area does not have suitable habitat for this species
Salt marsh vagrant shrew *Sorex vagrans halicoetes*	CSC	Limited to the salt marshes of the south arm of San Francisco Bay. Tidal marshes that provide dense cover, abundant food (primarily invertebrates), suitable nesting sites, and fairly continuous ground moisture.	No potential to occur. Project area does not have suitable habitat for this species.
American badger *Taxidea taxus*	CSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils. Needs sufficient food, friable soils, and open, uncultivated ground. Preys on burrowing rodents. Digs burrows.	Limited potential to occur. Only marginal habitat available.

CODES

FC: Federal Candidate for listing
FE: Federally Endangered
FT: Federally listed as Threatened
FD: Federal Delisted
CT: State of California Threatened
CSC: California Species of Special Concern
FPS: California Fully Protected Species
CP: State of California Proposed for listing
CE: State of California Endangered
SA: CDFG Special Animal; not considered special-status for CEQA analysis

SOURCES: CDFG, 2005; CDFG, 2006b; CDFG, 2006a; CDFG, 2006b; USFWS, 2005a; Zeiner et al., 1988, 1990a, and 1990b.

Monarch Butterfly

The CDFG has designated the monarch butterfly (*Danaus plexippus*) as a "special animal." This is a general term for animals that are considered sensitive regardless of their legal protection status. This species is not listed as threatened or endangered by the USFWS or CDFG under the federal or state endangered species acts, nor is the monarch butterfly a proposed or candidate species. However, California law (Assembly Bill 167, September 1987) recognizes monarch butterfly overwintering colonies as "special resources" in California, and these colonies are thus protected. Accordingly, the CDFG recognizes monarch butterfly winter roost sites as sensitive habitats. The range of monarch butterfly extends from southern Canada south through all of the United States, Central America, and most of South America, as well as Australia, Hawaii, other Pacific Islands, and the Azores. The wintering range is confined to California, Mexico, and Central and South America. Overwintering habitat for monarch butterflies is generally composed of large stands of trees, including eucalyptus, Monterey pine, and Monterey cypress, that exhibit specific habitat characteristics (e.g., canopy density, protection from prevailing wind, special arrangement of roost trees, low temperature variation). Potential winter roost trees are present in the project area, but no winter roosts have been reported and are, in any case, generally limited to one mile from the coast. The nearest monarch roosts are approximately 2.5 miles to the northeast of the project area on the edge of San Francisco Bay. Roosts are considered unlikely to occur in the project area.

Bay Checkerspot Butterfly

Bay checkerspot butterfly (*Euphydryas editha bayensis*) is federally listed as threatened (Federal Register, 1987). Critical habitat was designated for the bay checkerspot butterfly on April 30, 2001 (Federal Register, 2001), and a revision to the critical habitat for this species was proposed on August 22, 2007 (Federal Register, 2007a). This revision proposes to add an area just east of the project area, immediately east of I-280, but this additional area does not fall within the project area.

This butterfly utilizes more than one larval host plant species. Following mid-spring mating, the female butterflies lay their eggs on a native plantain (*Plantago erecta*). The eggs hatch and the larvae feed on this host until they have either developed to the point that they can enter dormancy, or the host has begun to dry up from the summer heat. If the plantain is not sufficient for development, the larvae may move on to one of two species of owl's clover (*Castilleja densiflorus* or *C. exserta*), which remain palatable for a longer period. Generally, one season is not sufficient for complete development, and the larvae must enter dormancy until the following winter, when the rains allow plant growth to begin again. The larvae then emerge to feed again, eventually pupating in late winter. The adults emerge shortly thereafter (Essig Museum, 2006).

Historically, the bay checkerspot butterfly inhabited numerous areas around San Francisco Bay, including the Peninsula, the mountains near San Jose, the Oakland Hills, and several locations in Alameda County. Most of these habitat areas have apparently disappeared due to the development of the San Francisco Bay Area in the past century. Populations are now known to occur only in San Mateo and Santa Clara Counties. Changing disturbance regimes (i.e., fire and grazing) as well as introduced grassland plants have caused declines in host plant populations (Essig Museum, 2006).

Dwarf plantain was observed intermittently in grasslands during surveys in 2006, including 17.7 acres in the project area. A few specimens of owl's clover (*Castilleja exserta*) were observed in grassland habitat on the eastern shore of Upper Crystal Springs Reservoir during surveys in 2006, but the species was not common there.

An unidentified species of checkerspot butterfly (there are five different genera of checkerspots) was observed during the reconnaissance-level wildlife survey in 2006. The nearest recorded location in the CNDDB for this butterfly is 1.8 miles to the southeast. Due to the limited potentially suitable habitat, the bay checkerspot butterfly is not likely to occur within the project area.

San Francisco Forktail Damselfly

San Francisco forktail damselfly (*Ischnura gemina*) is a state special animal. This species occupies small, marshy ponds and ditches with emergent and floating aquatic vegetation in the San Francisco Bay area (CDFG, 2009b).

Limited habitat for San Francisco forktail damselfly may be available at Tracy Lake and possibly in other shallow, ponded areas along the shoreline of the reservoirs.

Ricksecker's Water Scavenger Beetle

Ricksecker's water scavenger beetle (*Hydrochara rickseckeri*) is a state special animal (CDFG, 2009b). This aquatic species has been reported in the San Francisco Bay area. At one time, this beetle was thought to be limited to the Bay Area, but it has recently been collected in the Central Valley (CDFG, 2009c). Ricksecker's water scavenger beetle is an aquatic beetle that lives in shallow water in vernal pools and seasonal wetlands. It may also occupy similar habitats such as freshwater seeps, springs, and slow-moving streams. Members of the family Hydrophilidae, to which this beetle belongs, are scavengers, and the aquatic larvae are predaceous (CDFG, 2009c). No specific life history data are available for this beetle.

Ricksecker's water scavenger beetle was collected in the vicinity of the Pulgas Water Temple according to a 1954 report (CDFG, 2009c). Surveys for this beetle in the Bay Area in 1988 were unsuccessful in locating any individuals. Shallow-water areas of Upper and Lower Crystal Springs Reservoirs, such as the Tracy Lake area, may provide habitat for Ricksecker's water scavenger beetle.

Mission Blue Butterfly

Mission blue butterfly (*Plebejus icarioides missionensis*) is federally listed as endangered (Federal Register, 1976). This butterfly inhabits coastal grasslands and coastal scrub habitats that support perennial lupines, which provide food for the larvae. Specific larval host plants include silver bush lupine (*Lupinus albifrons*), varied lupine (*Lupinus variicolor*), and summer lupine (*Lupinus* *formosus*) (Thelander, 1994; Scott, 1986). The primary nectar plants for adults are coast buckwheat (*Eriogonum latifolium*), hairy false goldenaster (*Heterotheca villosa*), ookow (*Dichelostemma congestum*), and Ithuriel's spear (*Triteleia laxa*). Adult butterflies can be observed from late March to early July (Scott, 1986). Single eggs are deposited on leaves, stems, flowers, and seed pods of lupine species (Scott, 1986). Caterpillars feed on leaves after hatching 6 to 10 days later, and dormancy occurs three weeks later, with adults emerging the following spring after winter dormancy (Scott, 1986). This species occurs in San Mateo County, the Twin Peaks neighborhood in San Francisco, and the southern end of Marin County.

This butterfly uses three larval host plants: silver bush lupine, varied lupine, and summer lupine, of which silver bush lupine is favored. Summer lupine is a perennial herb that occurs in dry, open fields and sandy places, mostly below 2,500 feet, but up to 9,000 feet in elevation. Varied lupine is a shrub that is present in various coastal plant communities, including coastal strand and northern coastal scrub. The preferred habitat for varied lupine is grassy fields, slopes, and sand dunes below 1,000 feet in elevation. Silver bush lupine is a shrub found in sandy and rocky places in many communities below 5,000 feet. Five small individuals of a subspecies of silver bush lupine (*Lupinus albifrons* var. *collinus*) were observed on the eastern shore of Lower Crystal Springs Reservoir near the project area during surveys in 2006, but all of these plants were above the 291.8-foot elevation.

The nearest recorded location of the Mission blue butterfly to the project area is 1.8 miles to the northeast, below San Andreas Lake.

Critical habitat was proposed for the Mission blue butterfly on February 8, 1977 (Federal Register, 1977), but a final determination on critical habitat for this species has not been made. Proposed critical habitat for this butterfly is outside of the project area, in the San Bruno Mountains and the Twin Peaks neighborhood of San Francisco.

Myrtle's Silverspot Butterfly

Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*) is federally listed as endangered (Federal Register, 1992a). No critical habitat has been designated or proposed for the Myrtle's silverspot butterfly. This species is restricted to areas immediately adjacent to the coast, which include dunes, scrub, and grasslands (Essig Museum, 2006).

Historically, the Myrtle's silverspot butterfly was found along the coast, from the mouth of the Russian River in Sonoma County south to San Mateo County (Federal Register, 1992a). Extant populations are reported to occur only in Sonoma and Marin Counties (CDFG, 2009c). No butterflies have been observed at the historical population sites near Pacifica and San Mateo in San Mateo County since before 1992 (Federal Register, 1992a).

Adults of Myrtle's silverspot appear throughout the late summer and early fall. Adults live for about three weeks, during which time their activities include feeding on nectar, mating, and laying eggs. The eggs are laid only on certain species of violet (possibly only western dog violet [*Viola adunca*]), and hatch in the fall. Most of the larval feeding, however, occurs in the spring, when the majority of the violet's growth takes place. Adults emerge following a two-week pupation period (Essig Museum, 2006).

Western dog violet is perennial herb common to damp banks and meadow edges adjacent to forest communities, from elevations of 25 to 8,500 feet. Forest communities in the project area provide suitable habitat for western dog violet, but it was not observed during surveys in 2006. Johnny-jump-up (*Viola pedunculata*) was observed in the project area.

The nearest recorded location of this butterfly to the project area is 2.3 miles to the east.

California Tiger Salamander

California tiger salamander (*Ambystoma californiense*) is federally listed as threatened (Federal Register, 2004) and is a candidate for state listing.[4] This species historically occurred in the Central Valley and Sierra Nevada foothills from Colusa and Sacramento Counties to Kings and Tulare Counties. In the Coast Ranges, this salamander occurred from Solano County to Santa Barbara County as well as from central Sonoma County and southern San Mateo County (Zeiner et al., 1988). California tiger salamander habitat has two distinct components. The most obvious and best-known habitat comprises rain pools used for spawning. But far more important for the survival of individuals and colonies is the presence of burrow complexes of small mammals in grasslands and sparse oak woodlands. This salamander is strongly associated with California ground squirrel (*Spermophilus beecheyi*) burrows, but also uses soil crevices and burrows of other mammals such as Botta's pocket gopher (*Thomomys bottae*) and California vole (*Microtus californicus*) for refuge. This salamander spends about 80 to 90 percent of the year in mammal burrows, which prevents desiccation during the hot, dry summers that characterize the climate throughout most of the species' range in California. Typically, California tiger salamanders emerge from rodent burrows several times on rainy nights during the autumn and winter, and migrate to traditional spawning pool sites filled by winter rains (Stebbins, 1951). Eggs are deposited singly or in small clusters on submerged plant stems, hatching within about one to two weeks. After spawning, the adult salamanders return to the rodent burrow complexes and move deep underground. The cycle commences again with the first heavy rains of autumn. Larvae metamorphose in late spring, not long before the spawning pools begin to dry out. The nearest report of this species is 4.6 miles to the south in the San Franscisquito Creek watershed.

Seasonal wetlands within the grasslands and woodlands of the project area (and not associated with the reservoir) contain abundant small mammal burrows. These wetland areas may provide physically suitable breeding habitat. The seasonal wetlands of the reservoirs are not expected to provide suitable breeding habitat due to the extensive predatory fish populations. In addition, extensive aquatic surveys during the appropriate breeding season were conducted at the reservoir and other aquatic habitats near the project site, and no California tiger salamanders were found. There is a very low potential that this species would be present.

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[4] In February 2009, the California Fish and Game Commission formally designated California tiger salamander as a candidate for threatened or endangered status under the California Endangered Species Act, extending legal protections to the species for one year while a status review is conducted.

The USFWS has designated critical habitat for the Central California population of California tiger salamander, but the designation does not include the project area (Federal Register, 2005a).

California Red-Legged Frog

California red-legged frog (CRLF) (*Rana aurora draytonii*) is federally listed as threatened (Federal Register, 1996a) and is a California species of special concern (CDFG, 2009b). The USFWS released a recovery plan in 2002 (USFWS, 2002), and critical habitat for the CRLF was designated in 2001 (Federal Register, 1996a). However, on November 6, 2002, the U.S. District Court for the District of Columbia entered into a consent decree vacating the critical habitat designation (except Units 5 and 31) and remanding the designation to the USFWS to conduct an economic analysis. Critical habitat was again designated on April 13, 2006 (Federal Register, 2006b). Upper Crystal Springs Reservoir is not designated as critical habitat for the CRLF, but Lower Crystal Springs Reservoir is in Critical Habitat Unit SNM-1A.

Historically, the CRLF was present in coastal mountains from Marin County southward to northern Baja, California, and along the floor and foothills of the Central Valley from about Shasta County southward to Kern County (Jennings et al., 1992). Currently, this subspecies generally only occurs in the coastal portions of its historical range; it has been apparently extirpated from the valley and foothills and in most of southern California south of Ventura County. CRLFs are usually confined to aquatic habitats such as creeks, streams, and ponds, and occur primarily in areas that have pools about 3 feet deep, with adjacent dense emergent or riparian vegetation (Jennings and Hayes, 1988). Adult frogs move seasonally between their egg-laying sites and foraging habitat, but they rarely move long distances from their aquatic habitat. At one site in Santa Cruz County, 78 to 89 percent of adult frogs remained resident at their breeding location year-round, moving less than 425 feet from water (Bulger et al., 2003). Long-distance movement of more than two miles between aquatic sites has been reported (Bulger et al., 2003), but is likely a relatively rare event. CRLFs breed from November to March. Egg masses are attached to emergent vegetation (Jennings and Hayes, 1994) and hatch within 14 days. Metamorphosis generally occurs between July and September.

The presence of CRLFs has been documented within the Crystal Springs watershed (CDFG, 2009c; McGinnis, 1998; Swaim Biological, 2003, 2004, 2005; Kossack, undated). During the 2005, 2006, and 2007 survey period, Swaim Biological, Inc. documented CRLFs in various life stages (egg masses, larvae, recent metamorphs, and adults) in many locations within the study area. Known localities include the margins of Crystal Springs Reservoir, an artificial pond formed on the Crystal Springs Dam parapet, in San Mateo Creek below the LCSD, and in the vicinity of Sampling Station #5. Egg mass locations identified during these surveys were unevenly distributed throughout the reservoirs and were most frequently found in shallow open water with emergent vegetation. Water depth at egg mass locations averaged 4.8 inches; the vegetation used for egg attachment was predominantly bulrushes and more rarely cattails located an average of 11 feet from shore.

Foothill Yellow-Legged Frog

Foothill yellow-legged frog (FYLF) (*Rana boylii*) is a California species of special concern (CDFG, 2009b). This species inhabits foothill and mountain streams in the Coast Ranges from sea level to about 6,000 feet from the Oregon border southward to the Transverse Mountains in Los Angeles County, in most of northern California west of the Cascade crest, and along the western flank of the Sierra Nevada southward to Kern County. Most records are for occurrences below 3,500 feet. The FYLF is found in a variety of habitats, including valley-foothill hardwood, valley-foothill hardwood-conifer, valley-foothill riparian, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral, and wet meadow types (Zeiner et al., 1988). FYLFs historically occurred in the watershed in the drainage below San Andreas Lake and in the southern end of the watershed near creeks that cross Edgewood Road.

Home ranges are small, but these frogs may move several hundred yards to spawning habitat. Adult frogs congregate at suitable spawning sites as spring runoff declines when water temperatures reach 12 to 15 degrees Celsius (usually any time from mid-March to May, depending on local water conditions). The breeding season at any locality is usually about two weeks for most populations. Spawning frogs favor low to moderately steep-gradient streams (0 to 8 degrees). Females deposit eggs in shallow edge-water areas with water velocities less than 4 inches per second (Seltenrich and Pool, 2002). Egg masses are often attached to the downstream sides of cobbles and boulders, or to gravel, wood, or other materials. Eggs hatch in approximately five days. Tadpoles transform in three to four months and stay for a time in spawning habitat, but eventually disperse. They feed on diatoms or algae on the surface of the substrate (Stebbins, 1951). Tadpoles favor calm, shallow water. Juvenile and adult frogs bask on midstream boulders or in terrestrial sites along riffles, cascades, main channel pools, and plunge-pools, often in dappled sunlight near low overhanging vegetation. They are relatively strong swimmers and prefer faster water habitat than do other foothill frog species such as the exotic bullfrog (*Rana catesbeiana*) or the CRLF. Post-metamorphic FYLF prey almost exclusively on terrestrial insects and arachnids (Van Wagner, 1996).

Small areas of marginal habitat for the FYLF occur within the project area in San Mateo Creek above and below Lower Crystal Springs Reservoir. Extensive surveys for reptiles and amphibians were conducted in these areas, but did not detect FYLF. Many other small tributaries feed the reservoir, but these dried out completely between the wildlife surveys conducted on May 4 and June 26, 2006. Therefore, the potential for this species to occur in the project area is extremely low.

Western Pond Turtle

Western pond turtle (WPT) (*Clemmys marmorata marmorata* and *C. m. pallida*) is a California species of special concern (CDFG, 2009b). Historically, this turtle had a relatively continuous distribution in most Pacific slope drainages from Klickitat County, Washington, along the Columbia River to Arroyo Santo Domingo, northern Baja, California, and Mexico. The known elevational range of the WPT extends from near sea level to about 4,690 feet above sea level. In California, WPTs were historically present in most Pacific slope drainages between the Oregon and Mexican borders (Jennings and Hayes, 1994).

WPTs require some slack- or slow-water aquatic habitat. These turtles are uncommon in high-gradient streams, probably because water temperatures, current velocity, food resources, or any combination thereof can limit their local distribution. Habitat quality seems to vary with the availability of aerial and aquatic basking sites; however, WPTs often reach higher densities where many aerial and aquatic basking sites are available. Hatchlings require shallow-water habitat with relatively dense submergent or short emergent vegetation in which to forage. WPTs also require an upland nesting site in the vicinity of the aquatic site. Suitable nesting sites must have the proper thermal and hydraulic environment for incubation of the eggs. The thin-shelled eggs of these turtles are suited to development in a dry nest; in an excessively moist nest (irrigated areas), eggs have a high probability of failing. Nests are typically located on a slope that is unshaded to ensure that substrate temperatures are high enough to incubate the eggs.

This aquatic turtle usually leaves the aquatic site to reproduce, aestivate,[5] and overwinter. WPTs may overwinter on land or in water or may remain active in water during the winter season (Jennings and Hayes, 1994). Mating, which has rarely been observed, typically occurs in late April or early May, but may occur year-round. Females migrate from the aquatic site to an upland location and deposit from 1 to 13 eggs in a shallow excavation. The nesting site can be more than 1,315 feet from the aquatic site (Reese, 1996), but the average distance is probably less than 655 feet (Jennings and Hayes, 1994). Females may lay more than one clutch (the number of eggs laid in a single nesting) per year, usually during May and June, although some individuals deposit eggs as early as late April and as late as early August (Jennings and Hayes, 1994).

Within the project area, there is ample habitat suitable for supporting populations of turtles. The presence of WPTs was confirmed during reconnaissance-level wildlife surveys in May 2006 and herpetological surveys conducted on the reservoir from 2005 to 2007 at multiple sites around the reservoir. A nest was also discovered during wildlife surveys conducted in June 2006, but this nest had been depredated.

Horned Lizard

Coast horned lizard (*Phrynosoma coronatum frontale*) is a California species of special concern (CDFG, 2009b). Horned lizards forage on the ground in open areas, usually between shrubs and often near ant nests. The species relies on camouflage for protection and often hesitates to move at the approach of a predator. Horned lizards often bask in the early morning on the ground or on elevated objects such as low boulders or rocks. Horned lizards avoid predators and extreme heat by burrowing into loose soil. Periods of inactivity and winter hibernation are spent burrowed into the soil under surface objects such as logs or rocks, in mammal burrows, or in crevices. As a diurnal lizard, most of its activity occurs during the middle of the day in the spring and fall, but daytime activity is restricted to morning and late afternoon during mid-summer. Nocturnal activity may occur during particularly warm periods. Fall and winter are inactive periods in most areas. The horned lizard's spiny armor and aggressive behavior towards potential predators confer only partial immunity from predators. Lizards, snakes, shrikes, and hawks have all been reported as predators of horned lizards (Zeiner et al., 1988). It is considered to have a low likelihood to occur in the project area: open spaces for sunning and loose soil along some areas of the reservoir shoreline provide potentially suitable habitat for this species, but none were observed during surveys.

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[5] To spend the summer in a dormant or torpid condition.

San Francisco Garter Snake

San Francisco garter snake (SFGS) (*Thamnophis sirtalis tetrataenia*) is federally listed and state listed as endangered and is a California fully protected species (Federal Register, 1967; CDFG, 2009b). No critical habitat has been designated or proposed for this snake. The SFGS, a distinctive subspecies of the common garter snake, is restricted to the Peninsula. Hybrid or "intergrade" populations with California red-sided garter snake (*Thamnophis sirtalis infernalis*), of both natural and artificial origins, are known to exist in Marin County, northwestern Santa Clara County, southeastern San Mateo County, and in the vicinity of San Francisco International Airport in northeastern San Mateo County (Barry, 1994).

SFGSs are most frequently encountered near dense riparian and emergent vegetation along the borders of ponds, lakes, and streams. It is a habitat specialist, historically occurring in the sag ponds and marshes found along the Peninsula in San Mateo County and northern Santa Cruz County (Fox, 1951). These snakes particularly favor sag and dune ponds, coastal freshwater marshes, meadowland streams with overhanging willows, and shallow reservoir coves with extensive vegetation, but some stock and irrigation ponds also support colonies (Barry, 1978, 1994, 1996).

Approximately 95 percent of the SFGS's diet consists of frogs (Barry, 1994, 1996). Adult snakes feed primarily on CRLFs and Pacific chorus frogs, but they may also feed on juvenile bullfrogs. Adult bullfrogs are too large to be a food source, and larger bullfrogs likely prey on smaller SFGSs, possibly contributing to the decline of the species. Newborn and juvenile SFGSs depend heavily on Pacific tree frogs (*Pseudacris regilla*) as prey. If newly metamorphosed Pacific tree frogs are not available, the young may not survive. Other prey includes California newt (*Taricha torosa*) and small mosquito fish (*Gambusia affinis*).

Riparian and aquatic sites where frogs are abundant are considered important foraging areas for SFGSs. The dense vegetation generally present in such habitat also provides excellent cover and aids in thermoregulation[6] (Barry, 1978, 1994). Upland meadows are also present at all localities hosting the SFGS, and these meadows are usually contiguous with the riparian aquatic habitat component. Meadows offer basking habitat and hibernacula, which usually consist of rodent burrows and perhaps underground crevices and fissures (Barry, 1994; Larsen, 1994).

This species is known to occur within the project area (Barry, 1994; CDFG, 2009c; McGinnis, 1998; Swaim Biological, 2003, 2004, 2005, 2006, 2007, and 2008). Swaim Biological, Inc. conducted visual surveys of the reservoir margins in 2005, 2006, and 2007 and focused trapping surveys of the construction area below the dam in 2007. During the surveys, SFGSs were observed in various wetlands and uplands associated with the project zones for both Upper and Lower Crystal Springs Reservoirs. The SFGS has also been observed in the vicinity of Sampling Station #5.

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[6] Thermoregulation is the ability of an organism to keep its body temperature within certain boundaries, even when the surrounding temperature is very different. This process is one aspect of homeostasis: a dynamic state of stability between an animal's internal environment and its external environment.

The presence of SFGSs was also documented in the proposed construction area below the LCSD in 2007. Nearly all of the marsh habitat patches in the project area have the potential to support both the CRLF and SFGS at some population level. Marshes where there are healthy breeding populations of CRLF, bullfrog, or Pacific chorus frog are likely to support breeding populations of SFGSs as well.

Tricolored Blackbird

Tricolored blackbird (*Agelaius tricolor*) is a California species of special concern (CDFG, 2009b). This blackbird ranges throughout the Central Valley of California, typically nesting in colonies numbering several hundred. An adequate breeding ground for tricolored blackbird requires open water, protected nesting substrate, and a foraging area with insect prey within a few miles of the colony. Foraging habitat for this species in all seasons includes pastures, agricultural fields, and dry seasonal pools, with occasional foraging ground in riparian scrub, marsh borders, and grassland habitats. Egg-laying generally begins within four days of the colony's arrival, with a single egg being laid per day, and clutch size is usually around three to four eggs. Tricolored blackbirds typically leave their wintering areas in late March and early April for breeding locations in Sacramento County and throughout the San Joaquin Valley (Beedy and Hamilton, 1997).

Within the project area, there is suitable perennial wetland vegetation (bulrush and tule reeds) to support breeding and wintering tricolored blackbirds. Tricolored blackbirds were observed during the wildlife surveys on May 4 and May 5, 2006.

Bell's Sage Sparrow

Bell's sage sparrow (*Amphispiza belli belli*) is a California species of special concern (CDFG, 2009b). This subspecies is an uncommon to common but localized resident in the Coast Ranges of California from coastal Marin County and inland Trinity County southward through central Baja California (Martin and Carlson, 1998). Bell's sage sparrow breeds in dry chaparral and coastal sage scrub along coastal lowlands, inland valleys, and in the lower foothills of local mountains in California (Grinnell and Miller, 1944). This sparrow exhibits a preference for chamise chaparral (Unitt, 1984). In addition, high overgrown chaparral stands generally have fewer sage sparrows than shorter shrubs recovering from recent fires (Burridge, 1995).

Early successional chaparral is minimal within the project area. In addition, existing chaparral is of poor quality and dominated by exotic species. Therefore, the potential for this species to occur is limited.

Western Burrowing Owl

Western burrowing owl (*Athene cunicularia hypugaea*) is a California species of special concern (CDFG, 2009b). This owl was formerly a common permanent resident throughout much of California. However, a decline that became noticeable in the 1940s has continued to the present time (Grinnell and Miller, 1944). Western burrowing owl is a yearlong resident of open, dry grassland and desert habitats often associated with burrowing animals. This species is found in grass, forb, and shrub stages of pinyon and ponderosa pine habitats. Western burrowing owls commonly perch on fence posts or atop mounds outside their burrows. This owl is active both day and night, with a reduction of activity at the peak of the day. Western burrowing owl is an opportunistic feeder, with large arthropods constituting a majority of the diet. Small mammals, reptiles, birds, and carrion are also important components of the burrowing owl's diet (Zeiner et al., 1990a). The nesting season for this species occurs from February through August, with a peak in breeding from April to May. Western burrowing owls nest in burrows in the ground, often utilizing abandoned nests of ground squirrels or other small mammals. However, western burrowing owls may dig their own nests in areas of soft soil. Pipes, culverts, and nest boxes are also used in areas where burrows are scarce (Robertson, 1929).

The project area includes annual grasslands populated by burrowing mammals that could provide nests and prey for burrowing owls. While continuous grassland habitats are not present, such habitats are directly adjacent to the project area. Therefore, western burrowing owls may occur within the project area.

Marbled Murrelet

Marbled murrelet (*Brachyramphus marmoratus*) is federally listed as threatened (Federal Register, 1992b) and is state listed as endangered. Murrelets occupy the near-shore environment in the ocean and feed on zoöplankton, squid, and fish, primarily Pacific sand lance, northern anchovy, Pacific herring, smelt, and Pacific sardine. At sea, their distribution appears to vary between seasons (CDFG, 2009b; Henkel and Peery, 2008).

In California, this murrelet nests along the coast in two areas: from Eureka to the Oregon border and from Half Moon Bay to Santa Cruz, although its breeding range extends north into British Columbia, southern Alaska, and the Aleutian Islands (Piatt et al., 2007). Nesting habits remained an ornithological mystery until 1974, when a tree trimmer found a nestling high in an old-growth Douglas fir tree in Big Basin Redwoods State Park, located in the Santa Cruz Mountains of central California. This tree nesting habit is unique among diving seabirds. Murrelets lay a single egg high in old-growth trees on large horizontal limbs. Most nest sites are located in large intact stands of old-growth forest, but some nest sites have been found in smaller stands of large trees, or in areas where a few old-growth trees still exist in a second-growth landscape. The nesting season for this species runs from late March through mid-September (CDFG, 2005b).

There is little potential for marbled murrelet to be present within the project area, except as a rare transient. Murrelets could potentially nest within the stands of Douglas fir on the western side of the reservoir, although the stands near the reservoir are not associated with old-growth redwood.

Critical habitat for marbled murrelet was designated in 1996 (Federal Register, 1996b). No critical habitat units are located in the project area, but Critical Habitat Unit CA-13 is less than three miles to the south.

Ferruginous Hawk

Ferruginous hawk (*Buteo regalis*) is a California species of special concern (CDFG, 2009b). This hawk is an uncommon winter resident and migrant in the lower elevations and open grasslands of the Central Valley and Coast Ranges; it is a fairly common resident in the southern California grasslands and agricultural areas. There are no records of ferruginous hawk breeding in California. This species prefers open grasslands, sagebrush flats, desert scrubs, low foothills surrounding valleys, and fringes of pinyon-juniper habitats. Requiring open and treeless areas to hunt, ferruginous hawk feeds on rabbits, hares, ground squirrels, and mice as well as birds, reptiles, and amphibians. This hawk prefers to roost in open areas, usually in a lone tree or other elevated structure. Migration to California usually occurs in September, where ferruginous hawk will remain until mid-April (Zeiner et al., 1990a).

While the project area is outside this species' known geographic breeding range, there is potential for ferruginous hawk to migrate through or winter in the area. This species tends to frequent open grasslands, which are present within only a small part of the expected inundation zone. Therefore, there is little potential for this species to occur near the reservoir margin.

Vaux's Swift

Vaux's swift (*Chaetura vauxi*) is a California species of special concern (CDFG, 2009b). This swift is a summer resident of northern California, preferring redwood and Douglas fir habitats. Between April and May, and August and September, Vaux's swift is a fairly common migrant throughout the state. Nesting typically takes place in hollow trees in redwood, Douglas fir, and occasionally other coniferous forests, with the nest located near the bottom of the cavity. Vaux's swift shows a preference for foraging over rivers and lakes, but will forage over most terrain or habitat. This species feeds almost exclusively on flying insects taken in long continuous foraging flights. Vaux's swift breeds from early May to mid-August, with a usual clutch size of four to five eggs (Zeiner et al., 1990a).

The project area provides suitable Douglas fir habitat for nesting Vaux's swifts and abundant aquatic foraging habitat for this species. The presence of this species was confirmed during reconnaissance-level wildlife surveys.

Saltmarsh Common Yellowthroat

Saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*) is a California species of special concern (CDFG, 2009b). This migratory bird ranges from Canada to southern Mexico, and winters from the southern United States to the West Indies and Panama. The subspecies is a resident of the San Francisco Bay area, inhabiting freshwater and saltwater marshes. Saltmarsh common yellowthroat requires contiguous freshwater and saltwater marsh habitats. It also requires thick, continuous cover down to the water surface for foraging, as well as tall grasses, tule patches, or willows for nesting.

There are small patchy localities in the project area where sufficient tule vegetation exists to support this species. The stands of dense willow habitat that are also present can support breeding yellowthroats. The presence of breeding saltmarsh common yellowthroats was confirmed during reconnaissance-level wildlife surveys conducted in the project area in May 2006.

Loggerhead Shrike

Loggerhead shrike (*Lanius ludovicianus*) is a California species of special concern (CDFG, 2009b). This shrike is a common resident and winter visitor in lowlands and foothills throughout California. It prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches. The highest density of these shrikes in California occurs in open-canopied valley foothill hardwood, valley foothill hardwood-conifer, valley foothill riparian, pinyon-juniper, juniper, desert riparian, and Joshua tree habitats. Loggerhead shrike occurs only rarely in heavily urbanized areas, but is often found in open cropland. It builds its nest on a stable branch in the dense foliage of a usually well-concealed shrub or tree. Nest height is 1 to 50 feet aboveground. Egg-laying occurs from March into May, and young become independent in July or August. Loggerhead shrike is a monogamous and solitary nester with a clutch size of four to eight eggs. Incubation lasts 14 to 15 days. Young are tended by both parents and leave the nest at 18 to 19 days (Zeiner et al., 1990a).

There is suitable breeding and foraging habitat in the project area to support this species. Substantial tracts of riparian woodland occur within the historical inundation zone. Open oak-grasslands at the southern end of the reservoir provide potential foraging opportunities. This species is expected to occur within the project area.

California Black Rail

California black rail (*Laterallus jamaicensis coturniculus*) is state listed as threatened and is a California fully protected species (CDFG, 2009b). This rail occupies tidal and freshwater marshes in coastal California between Bodega Bay and Morro Bay, and inland at the Salton Sea and lower Colorado River. Drastic population declines have been recorded throughout its range, corresponding with the widespread loss of marsh habitat to agriculture, salt production, and urban development. The species has been eliminated from coastal California south of Morro Bay (Eddleman et al., 1994). California black rail is a year-round resident in the state, and only short migrations have been recorded between breeding and nonbreeding habitats. The species is active throughout the day and forages on small invertebrates and seeds. It occupies saltwater and freshwater marshes and sloughs and is most abundant in tidal marshes near the high tide level (Evens et al., 1991). Access to well-vegetated upland areas for refuge during high tides may be an essential habitat component. Nesting habitat generally consists of a dense cover of pickleweed, bulrush, saltgrass, or cattails (CDFG, 1992). Between three to eight eggs are laid in April and May. Juveniles are known to disperse close to one mile (Eddleman et al., 1994).

There is some potential for this species to occur within the project area. Suitable freshwater marshes exist in the project area, and the relative proximity to the large saltwater marshes of San Francisco Bay increases the likelihood for this species to be present, although the potential is low.

Long-Billed Curlew

Long-billed curlew (*Numenius americanus*) is a California species of special concern (CDFG, 2009b). In California, this curlew is reported to nest on elevated interior grasslands and wet meadows, usually adjacent to lakes or marshes. Breeding long-billed curlew are typically present in northeastern California from April to September. Generally a solitary nester, long-billed curlew may be loosely colonial in favorable habitats. Both parents incubate an average clutch size of four eggs for 27 to 28 days. Long-billed curlew prefers to winter in large coastal estuaries, upland herbaceous areas, and croplands. In some years, large numbers of nonbreeders remain in the Central Valley. Long-billed curlew uses its characteristic long bill to probe deep into substrate or to grab prey from mud surfaces. In inland areas, long-billed curlew preys on insects (both adults and larvae), worms, spiders, berries, crayfish, snails, and small crustaceans. Occasionally this curlew will take nestling birds. In coastal estuaries and intertidal zones, long-billed curlew preys on mud crabs, ghost shrimp, mud shrimp, insect pupae, gem clams, and small estuarine fish (Zeiner et al., 1990a).

While long-billed curlew primarily uses tidal estuaries as wintering habitat, it has been recorded foraging along freshwater marsh habitat. This species could potentially winter in or migrate through the project area.

Double-Crested Cormorant

Double-crested cormorant (*Phalacrocorax auritus*) is a California species of special concern (CDFG, 2009b). This species is a yearlong resident along the entire coast of California and on inland lakes, typically in fresh, salt, and estuarine waters. From August to May, this cormorant is fairly common to locally very common along the coast, as well as in estuaries and salt ponds. This species rests in daytime and roosts overnight beside water on offshore rocks, islands, steep cliffs, dead tree branches, wharfs, jetties, or even transmission lines. Double-crested cormorant must visit perches periodically during the day to dry plumage, and the perching sites must be devoid of vegetation. This species sometimes rests, or even sleeps, on water in daytime. It requires either a considerable stretch of water or an elevated perch for takeoff (Remsen, 1978).

Double-crested cormorants feed mainly on fish, but also on crustaceans and amphibians. They dive from the waters' surface to pursue prey underwater, usually remaining submerged for about 30 seconds. These birds prefer water that is less than 30 feet deep with a rocky or gravel bottom, but may catch fish as deep as 72 feet, occasionally feeding cooperatively in flocks of up to 600, often with pelicans (Remsen, 1978). This cormorant requires undisturbed nest sites beside water, on islands or the mainland, for breeding success. For nesting sites, this species prefers to utilize wide rock ledges on the rugged slopes of cliffs, and live or dead trees, especially tall ones (Remsen, 1978).

Double-crested cormorants were observed during project wildlife surveys on June 26, 2006 and during bird surveys conducted in June 2007.

Bank Swallow

Bank swallow (*Riparia riparia*) is state listed as threatened (CDFG, 2009b). This species arrives in California from South America in early March and remains until early August, when colonies are abandoned and migration begins. Bank swallow is found primarily in riparian and other lowland habitats in California west of the desert during the spring-through-fall period. This species is a common migrant within the interior of the state during the spring-through-fall period, and less common along the coast. There are few records of species presence during the winter months in California. During the summer, bank swallow is restricted to riparian, lacustrine, and coastal areas with vertical banks, bluffs, and cliffs with fine-textured or sandy soils. This swallow is a colonial breeder. Approximately 75 percent of the current breeding population in California nests along the banks of the Sacramento and Feather Rivers in the northern Central Valley. Bank swallows breed from early May through July, digging horizontal nesting tunnels and burrowing along the side of stream banks and cliffs. Most colonies contain 100 to 200 nesting pairs. The species feeds predominantly over open riparian areas, but will also forage over brushland, grassland, wetlands, water, and irrigated cropland. The diet of bank swallows includes a wide variety of aerial and terrestrial soft-bodied insects, including flies, bees, and beetles (Zeiner et al., 1990a).

Along the margins of the reservoir, erosional processes have created vertical shorelines that may potentially serve as suitable nesting substrate. Horizontal burrows into such banks were observed during project surveys in 2006, although these did not appear to be nesting sites of bank swallows.

California Least Tern

California least tern (*Sterna antillarum browni*) is federally listed as endangered (Federal Register, 1970a), and is also state listed as endangered and is a California fully protected species (CDFG, 2009b). No critical habitat has been designated or proposed for this tern. California least tern is found along the Pacific Coast of California, from San Francisco southward to Baja, California. The California populations where least tern is federally listed as endangered are localized and increasingly fragmented. Both the coastal and interior breeding populations of least terns winter broadly across the marine coastlines of Central and South America (Thompson et al., 1997).

California least terns nest in colonies on relatively open beaches kept free of vegetation by natural scouring from tidal action. Their nest is a simple scrape in the sand or in shell fragments. Pairs can re-nest up to two times if eggs or chicks are lost. Least terns are very gregarious, and forage, roost, nest, and migrate in colonies. Fall migration commences between the last week in July and first week in August. Several weeks before fall migration begins, adults and young wander along marine coastlines, congregating at prime fishing sites (Thompson et al., 1997).

Alameda Naval Air Station is the site of one of the largest and most successful breeding colonies in California, and the only substantive colony in central California. As part of the federal government's disposal of the military bases, the tern colony and surrounding wildlife habitat are being transferred to the USFWS for management. Adjacent parts of the base are proposed for a variety of public uses. Area management and reuse plans are now being developed (CDFG, 2000a).

California least tern is unlikely to breed within the project area due to the distance from marine habitats. However, there is a limited potential for post-nesting individuals to forage in the project area. The nearest reported location is six miles to the east, on the western shore of San Francisco Bay.

Cooper's Hawk

Cooper's hawk (*Accipiter cooperii*) is a California species of special concern (CDFG, 2009b). This hawk is a yearlong resident throughout most of the wooded portion of the state. In addition, individuals that breed in more northern areas may winter in California. Cooper's hawk, which can be found in elevations ranging from sea level to 1,065 feet above sea level, requires dense stands of live oak, riparian deciduous, or other forest habitats near water when nesting. The breeding season begins in March and continues through August, with average clutch sizes of four to five eggs. Cooper's hawk feeds primarily on small birds, particularly young birds during the nesting season. This diet is supplemented with reptiles and amphibians. Hunting takes place in broken woodland and habitat edges. This hawk is seldom found in areas without dense tree stands (Zeiner et al., 1990a).

The large tracts of contiguous, undisturbed oak and mixed hardwood forest within the project area could support breeding and resident Cooper's hawks. The project area also provides foraging resources for this species.

Osprey

Osprey (*Pandion haliaetus*) is a California species of special concern (CDFG, 2009b). This raptor is found primarily in ponderosa pine and mixed conifer habitats along seacoasts, lakes, and rivers. It preys mostly on fish at or below the water surface, but will also take small mammals, birds, reptiles, amphibians, and invertebrates. Foraging areas require large snags and open trees near large, clear, open waters. Ospreys typically swoop from flight and hover or perch to catch prey. The species breeds primarily in northern California and typically builds nests in large conifers, but may also use artificial platforms as nesting areas. The breeding season is from March to September. Nests are built on platforms of sticks at the top of large snags, dead-topped trees, on cliffs, or on human-made structures. A nest may be as much as 250 feet above ground and is usually within 1,000 feet of fish-producing water. Osprey need tall, open-branched "pilot trees" nearby for landing before approaching the nest and for use by young for flight practice. Typically, this species migrates in October southward along the coast and the western slope of the Sierra Nevada to Central and South America (Zeiner et al., 1990a).

While nesting trees for osprey are unlikely to be present within the historical inundation zone, the potential for this species to use the reservoir as foraging habitat is very high. Large Douglas fir stands on the western side of the reservoir could support breeding osprey. Due to the proximity of this habitat to the reservoir, osprey are expected to occur in the project area.

Sharp-Shinned Hawk

Sharp-shinned hawk (*Accipiter striatus*) is a California species of special concern (CDFG, 2009b). This hawk is a migrant and winter resident throughout California, except in areas of deep snow, open prairie, and desert (Zeiner et al., 1990a). Formerly, small numbers of this species bred in northern California and in very small numbers in southern California and the Bay Area (Remson, 1986). Sharp-shinned hawk breeds in deciduous riparian, black oak, mixed conifer, ponderosa pine, and Jeffrey pine forests. Nests are usually situated in dense stands of young conifers near water. Plucking perches on north-facing slopes are essential for this species (Zeiner et al., 1990a). The breeding season begins in April and continues through August. Like the closely related Cooper's hawk, sharp-shinned hawk feeds primarily on small birds, particularly young birds during the nesting season. This diet is supplemented with reptiles, amphibian, and insects. This hawk often hunts in openings at habitat edges and shorelines (Zeiner et al., 1990a).

The large tracts of contiguous, undisturbed oak and mixed hardwood forest within the project area provide foraging resources for this species. These habitats could also provide nesting habitat for sharp-shinned hawks. No breeding in this area has been reported.

Northern Harrier

Northern harrier (*Circus cyaneus*) is a California species of special concern (CDFG, 2009b). This hawk is a permanent resident of northeastern California, coastal California, and the Central Valley, preferring open habitats such as grasslands, meadows, desert sinks, and freshwater and saltwater emergent wetlands (Zeiner et al., 1990a). This species is a widespread winter resident where suitable habitat is available. The breeding season for northern harrier extends from April to September, and nesting typically takes place on the ground in shrubby vegetation at the edges of marshes or along rivers and lakes. This species may also nest in grasslands, grain fields, and sagebrush flats. Northern harrier forages in low flights over open ground, feeding primarily on voles and other small mammals. However, this hawk will also prey on birds, frogs, reptiles, crustaceans, insects, and even (rarely) on fish (Zeiner et al., 1990a).

The project area provides suitable habitat for northern harrier, including both shrubby vegetation adjacent to marshes for nesting and abundant foraging habitat. A web-based listing reports the presence of this species in the reservoir area (eBird, 2009).

White-Tailed Kite

White-tailed kite (*Elanus leucurus*) is a California fully protected species, although it has no other regulatory status (CDFG, 2009b). This species is a yearlong resident in California. This kite inhabits herbaceous and open stages of most habitats in cismontane California and uses herbaceous lowlands with variable tree growth, especially those with dense populations of voles. Substantial groves of dense, broad-leaved, deciduous trees are used for nesting and roosting. White-tailed kites forage in undisturbed, open grasslands, meadows, farmlands, and emergent wetlands. This species begins breeding in January and February, with most fledging complete by October (Zeiner et al., 1990a).

The CDFG has not reported the presence of white-tailed kite in the project area (2009c), and the species was not observed during project surveys in 2006 and 2007. However, a web-based listing reports species occurrence in the reservoir area (eBird, 2009).

Merlin

Merlin (*Falco columbarius*) is a California species of special concern (CDFG, 2009b). This falcon is a winter migrant in California. This species winters in a variety of habitats from the coast to grasslands, savannahs, woodlands, and open forests in the mountains, but it prefers open habitats near water (Zeiner et al., 1990a). In California, merlin is found at elevations up to 3,900 feet, primarily in the western half of the state.

Within the project area, herbaceous wetlands, grasslands, and woodlands provide foraging and roosting habitat for merlin. This species is not expected to breed in the project area.

American Peregrine Falcon

American peregrine falcon (*Falco peregrinus anatum*) is state listed as endangered and is a California fully protected species (CDFG, 20069). This falcon was formerly federally listed as endangered (Federal Register, 1970a, 1970b), but was delisted in 1999 (Federal Register, 1999). This medium-sized raptor breeds from non-Arctic portions of Alaska and Canada, southward to Baja California (except on the coast of southern Alaska and in British Columbia), and locally in central Arizona and Mexico. American peregrine falcons usually winter in their breeding range. The primary nesting habitat for American peregrine falcon tends to be cliffs or series of cliffs that dominate the surrounding landscape. However, suitable nesting sites can also be found in river cutbanks, trees, and man-made structures, including tall towers and the ledges of tall buildings. American peregrine falcons hunt their prey in the air, usually over open habitat types such as waterways, fields, and wetland areas, diving at speeds of up to 200 miles per hour to strike their targets. Jays, flickers, meadowlarks, pigeons, starlings, shorebirds, waterfowl, and other readily available species make up the American peregrine falcon's diet. These raptors may travel 10 to 12 miles from their nests in search of prey. Breeding takes place in later March and April, with a usual clutch size of three to four eggs. Adults continue to feed fledglings for up to two months after the fledglings leave the nest.

An adult peregrine was observed feeding a juvenile within the project area downstream from the LCSD during the second breeding-bird site visit in late June 2007. The two birds perched on the I-280 bridge, which crosses San Mateo Creek 460 feet downstream from the LCSD. This bridge may provide suitable nesting sites, although no evidence of nesting was observed. A peregrine was also observed foraging in the vicinity of the Boat Ramp in 2009. There is no suitable nesting habitat within the expected inundation zone; however, the reservoir and associated waterfowl represent suitable foraging resources for this species.

Common Loon

Common loon (*Gavia immer*) is a California species of special concern (CDFG, 2006b). In North America, common loons historically bred across Canada north into Alaska and south across the northernmost United States, as far south as California. However, breeding activity has declined in many states at the southern side of the common loons' breeding range, including California, Iowa, Illinois, and Pennsylvania. In winter, this species can be found from Alaska south to Mexico along the Pacific Coast and in eastern Canada south to Mexico along the Atlantic Coast. Common loons formerly bred above 5,000 feet in Shasta and Lassen Counties on several lakes in the northeastern plateau region in California. There has been no reported attempted breeding activity in California since 1974, when a pair was observed in Mono County.

Common loons breed in lakes and ponds and winter in a variety of near-shore marine environments as well as inland lakes. Nests, comprised of aquatic vegetation, are located at the water's edge on islands or along the shoreline of a pond or lake. For successful breeding to occur, common loons need access to lakes and ponds that have stable water levels, good underwater visibility for foraging, little or no human disturbance, a suitable prey base, and shallow, sheltered areas for brood rearing, which lasts several weeks. Adults have been reported to return to the same breeding territories year after year. Nonbreeding loons often stay in their wintering range during the spring and summer instead of migrating to breeding sites.

A common loon in nonbreeding plumage was observed on Lower Crystal Springs Reservoir during project surveys in June 2007. This bird was likely a nonbreeding loon that did not migrate. The project area does not provide the stable water levels needed for successful breeding and is considerably south of the species' former breeding range in California.

Pacific Western Big-Eared Bat

Pacific western big-eared bat (*Corynorhinus* [*Plecotus*] *townsendii townsendii*) is a California species of special concern (CDFG, 2009b). This bat occurs throughout California, although available information on its distribution is limited. This bat occupies the humid coastal regions of northern and central California, living in a variety of habitats that include coastal conifer and broad-leaf forests, oak and conifer woodlands, arid grasslands and deserts, and high-elevation forests and meadows. Throughout most of its geographic range, this bat is most common in mesic sites. Known roosting sites in California include limestone caves and lava tubes, though the species will also use mine tunnels, buildings, and other human-made structures. Habitat must include appropriate roosting, maternity, and hibernacula sites that are free from disturbances by humans. A single visit by humans can cause the bats to abandon a roost. Females typically roost in large maternity colonies, which are highly susceptible to disturbance. Males usually roost singly or in small groups, and are probably not affected as much as females by disturbances. Both sexes hibernate in buildings, caves, and mine tunnels, either singly (males) or in small groups (Williams, 1986).

The project area offers suitable habitat for Pacific western big-eared bat due to this species' habitat preference for coastal woodlands and its avoidance of human activities. Anthropogenic structures within the project area may provide roosting opportunities, and the variety of mixed hardwood forests and oak woodlands provide foraging habitat. This species is likely to occur within the project area.

Pallid Bat

Pallid bat (*Antrozous pallidus*) is a California species of special concern (CDFG, 2009b). This species ranges from western Canada to central Mexico and is widely distributed at lower elevations in California (Zeiner et al., 1990b). Pallid bat utilizes a variety of habitats, including grasslands, shrublands, woodlands, and forests, although it is most commonly found in open habitats with rocky areas for roosting. This bat seems to prefer foraging in the open. Pallid bats utilize three different types of roosts. The day roost is usually in a warm, horizontal opening such as an attic or rock crack; the night roost is usually in the open, near foliage; and the hibernation roost is often in buildings, caves, or cracks in rocks (Miller, 2002).

Pallid bats are likely to occur within the project area. Although the project area lacks the granite and rocky exposures necessary for roosting, anthropogenic structures within the project area may serve as suitable roosting sites. Insects associated with grasslands and aquatic habitats within the project area provide foraging resources for this species.

Greater Western Mastiff Bat

Greater western mastiff bat (*Eumops perotis californicus*) is a California species of special concern (CDFG, 2009b). This bat is found from central California southward to central Mexico. In California, it has been recorded from Butte County southward in the western lowlands through the southern California coastal basins and the western portions of the southeastern desert region. All others reports are from lower-lying regions. This species is resident within the state, although some bats probably migrate from the colder areas to winter in the southern lowlands (Williams, 1986).

Mastiff bats appear to favor rugged, rocky areas where suitable crevices are available for day roosts. Characteristically, day roosts are located in large cracks in exfoliating slabs of granite or sandstone. The crevices must open downward, must be at least 2 inches wide and 12 inches deep, and must narrow to approximately 1 inch at the upper end. The crevices typically open high on a cliff and are at least 6 feet above the substrate. Mastiff bats have great difficulty taking flight and must drop at least 6 to 10 feet for launching. These bats also frequently roost in buildings, provided they have sheltering spaces with conditions similar to those described above (Williams, 1986).

Mastiff bats have been estimated to forage as much as 2000 feet above ground, often regularly foraging at 100 to 200 feet over the substrate. They probably forage for considerable distances from their roosting sites. For example, colonies roosting in suitable sites in the Diablo and Temblor Ranges, flanking the San Joaquin Valley, likely foraged over the valley floor where insects were more abundant. Extensive loss of habitat due to the urbanization of coastal basins, marsh drainage, and cultivation of major foraging areas are likely factors in their decline. Widespread use of insecticides has likely reduced insect abundance and also possibly poisoned some bats (Williams, 1986).

Mastiff bats are likely to occur within the project area. Although the project area lacks the granite and rocky exposures necessary for roosting, anthropogenic structures within the project area may serve as suitable roosting sites. Insects associated with grasslands and aquatic habitats within the project area provide foraging resources for this species.

Big Free-Tailed Bat

Big free-tailed bat (*Nyctinomops macrotis*) is a California species of special concern (CDFG 2009b). Big free-tailed bats are found from northern South America and the Caribbean Islands northward to the western United States. Populations in the southwestern United States appear to be widely scattered. Known breeding localities in the United States are found in parts of Arizona, New Mexico, and Texas. In California, big free-tailed bats are known to exist in only a few low-lying arid areas of southern California, and a single specimen was found Berkeley in Alameda County. There are records of accidental occurrences (stray, migratory individuals) in widely scattered localities in western North America, including British Columbia and Iowa (Williams, 1986).

Very little is known about the distribution of big free-tailed bat in California. This species may not occur regularly within the state. The records, however, do suggest that big free-tailed bats breed somewhere within the state. The most likely breeding location is in the rugged, wooded, and mountainous areas of southern California.

Big free-tailed bats in other states are found in rugged and rocky terrain. This bat ranges up to elevations of 8,000 feet in New Mexico, southern Arizona, and Texas. This species is probably a yearlong resident. Many individuals wander widely in autumn, however, resulting in records far outside of the normal range. This bat feeds principally on large moths, but it takes a variety of other flying insects as well. Big free-tailed bats often forage over water sources. They typically roost in crevices in high cliffs or rock outcrops. These bats probably do not breed in California. In other states, small nursery colonies are formed in rocky crevices in high cliffs. Female bats bear a single offspring each year, in June and July, with births peaking in late June. The young are capable of flight in August to mid-September.

While the project area includes suitable foraging habitat, it lies outside of the known geographic range for big free-tailed bats. This species is unlikely to occur.

San Francisco Dusky-Footed Woodrat

San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*) is a California species of special concern (CDFG, 2009b). This subspecies is found on the Peninsula southward to Santa Cruz County, and in the East Bay hills as well. It is a medium-sized native rodent. Dusky-footed woodrats are widespread in chaparral, woodland, and forest habitats with well-developed undergrowth, where their conical stick houses are often visible (Carraway and Verts, 1991). These houses may be as much as 6 feet tall, and contain multiple chambers used for sleeping and food storage. Houses are usually occupied by single adults or females with young and can be used by successive generations of woodrats. Woodrat houses provide cover for many other animal species, including small mammals, reptiles, amphibians, and arthropods—thus increasing local biodiversity (Cranford, 1982; Vestal, 1938). Woodrats feed primarily on the foliage of evergreen broadleaf plants such as oaks, coffeeberry (*Rhamnus californica*), Mexican elderberry, toyon, and gooseberry (*Ribes* spp.) (Atsatt and Ingram, 1983). Reproduction occurs from February through September.

Suitable habitat for San Francisco dusky-footed woodrat is widespread in the project area. A woodrat nest was observed during the reconnaissance-level wildlife survey conducted by Entrix biologists in May 2006.

American Badger

American badger (*Taxidea taxus*) is a California species of special concern (CDFG, 2009b). This badger is an uncommon but permanent resident found throughout most of the state. The badger is active throughout the year in most of its range in California, except in the North Coast area where it enters variable periods of torpor in winter. This species is both nocturnal and diurnal, and frequents drier open stages of most shrub, forest, and herbaceous habitats. Badgers dig burrows in friable soil for cover. They frequently reuse old burrows, although some may dig a new den each night, especially in summer. Home range estimates vary geographically and seasonally. Ranges recorded in other western states varied from 338 to 1,549 acres, with the males usually occupying the larger territories. Badgers mate in summer and early fall, with young born mostly in March and April in burrows that are usually found in areas with sparse overstory cover (CDFG, 2009c). Habitat for American badger is present in the project area, although neither badgers nor their burrows were observed during the 2006 reconnaissance surveys.

5.13.2 Regulatory Framework

5.13.2.1 Federal Regulations

Federal Endangered Species Act

Under the Federal Endangered Species Act (FESA), the Secretary of the Interior (represented by the USFWS) and the Secretary of Commerce (represented by the National Marine Fisheries Service, NMFS) have joint authority to list a species as threatened or endangered (16 United States Code [USC] 1533[c]). Within the LCSDI project study area, six animal species and five plant species listed as threatened or endangered under FESA are known to occur, are presumed present, or have a moderate potential to occur (Tables 5.13-1 and 5.13-2). For the proposed project, impacts on these species or their habitats would be considered potentially significant.

Pursuant to the requirements of FESA, a federal agency reviewing a proposed project within its jurisdiction must determine whether any federally listed threatened or endangered species may be present in the project area and determine whether the project may affect a listed species.

If endangered species or endangered migratory fish protected under FESA are present in the project area, a consultation between the lead federal agency and the USFWS and/or NMFS under Section 7 of the act may be required. If consultation is required, a Biological Assessment is prepared to evaluate the potential impacts of a particular project on listed species that are known or likely to occur in the project area. The agency with jurisdiction over the listed species (either the USFWS or NMFS) then reviews the Biological Assessment and issues a Biological Opinion—that is, the USFWS' or NMFS' determination as to whether or not the proposed project will jeopardize the listed species or result in the modification of critical habitat (16 USC 1536[3], [4]). The Biological Opinion includes the conditions under which the project may proceed and includes an incidental take authorization that identifies the number of listed species or acres of habitat allowed to be harmed by project activities without violating the terms of the permit. Under FESA, the Secretary of the Interior (or the Secretary of Commerce, as appropriate) formally designates critical habitat to ensure the survival and recovery of listed species. Critical habitat is not automatically designated for FESA-listed species, so many species have no designated critical habitat. Designated critical habitat in the project area is shown in **Figure 5.13-3**.

The USFWS also publishes a list of candidate species for listing. Species on this list receive special attention from federal agencies during environmental review, although they are not otherwise protected under FESA. The candidate species are those for which the USFWS has sufficient biological information to support a proposal to list as endangered or threatened (but does not do so in order to address higher-priority species instead). No candidate species for federal listing are present in the project study area.

Clean Water Act

Wetlands and other waters (e.g., rivers, streams, and natural ponds) are a subset of "waters of the U.S." and receive protection under Section 404 of the Clean Water Act. The Corps has primary federal responsibility for administering Clean Water Act regulations and requires a permit if a project discharges dredged, excavated, or fill material in wetlands, streams, rivers, and other U.S. waters. The U.S. Environmental Protection Agency (U.S. EPA), USFWS, NMFS, and several other agencies may provide comment on Corps permit applications, and the U.S. EPA can veto the Corp's issuance of a permit. For certain activities that would result in minimal impacts, the Corps issues a nationwide permit designed to streamline the permitting process. To obtain a Corps permit, project proponents must demonstrate that they have attempted to avoid the resource or minimize impacts on the resource; however, if it is not possible to avoid impacts or minimize impacts further, the project proponent must mitigate remaining project impacts on all Corps-regulated waters of the U.S.

State and Federal Jurisdictional Waters within the Project Study Area

The total extent of federal jurisdictional waters in the project study area is 308.49 acres, which fall under state jurisdiction as well (see below). In addition, 1,033.61 acres of open water are under state jurisdiction only (see Appendix G of this EIR; Entrix/MSE, 2007).

Migratory Bird Treaty Act

The federal Migratory Bird Treaty Act (MBTA) (16 USC, Section 703, Supp. I, 1989), as amended by the Migratory Bird Treaty Reform Act, prohibits killing, possessing, or trading in migratory birds, except in accordance with regulations prescribed by the Secretary of the Interior. The act addresses whole birds, parts of birds, and bird nests and eggs. For projects such as the LCSDI that would not cause direct mortality of birds, the MBTA is generally interpreted in CEQA analyses as protecting active nests of all species of birds that are included in the "List of Migratory Birds" published in the Federal Register in 1995 and as amended in 2005. Though the MBTA allows permits to be issued for import and export, banding, scientific collecting, taxidermy, and rehabilitation, among other reasons, there is no provision in the MBTA that allows for species take[7] related to construction or other development (Code of Federal Regulations, Title 50: Wildlife and Fisheries Part 21; Migratory Bird Permits).

5.13.2.2 State of California Regulations

California Endangered Species Act

Under the California Endangered Species Act (CESA), the CDFG has responsibility for maintaining lists of:

- Threatened and endangered species
- Candidate species (species for which the California State Fish and Game Commission has formally accepted a petition for listing, but for which it has not yet issued a ruling)
- Species of special concern (animal species whose populations have diminished and may be considered for listing if declines continue)

Pursuant to the requirements of CESA, a state or local public agency reviewing a proposed project within its jurisdiction must determine whether any state-listed endangered or threatened species may be present in the project area and determine whether the project will have a potentially significant impact on such species. In addition, the CDFG encourages informal consultation on any proposed project that could affect a candidate species. Actions otherwise prohibited under CESA can be legalized under the state's Natural Community Conservation Planning Act (Fish and Game Code Sections 2800–2840), which is somewhat broader in its orientation and objectives than CESA or FESA and focuses on the preservation of habitat. More commonly, and for the potential taking of individual animals (as opposed to habitat) listed under CESA, Fish and Game Code Sections 2080.1 and 2081 provide for the issuance of an incidental take permit. The CDFG will issue an incidental take permit only if: the authorized take is incidental to an otherwise lawful activity; the impacts of the authorized take are minimized and fully mitigated; and adequate funding is provided to implement the minimization and mitigation measures. Six state-listed plant species and five state-listed animal species are known to occur within the study area, are presumed to be present, or are likely to occur there (Tables 5.13-1 and 5.13-2).

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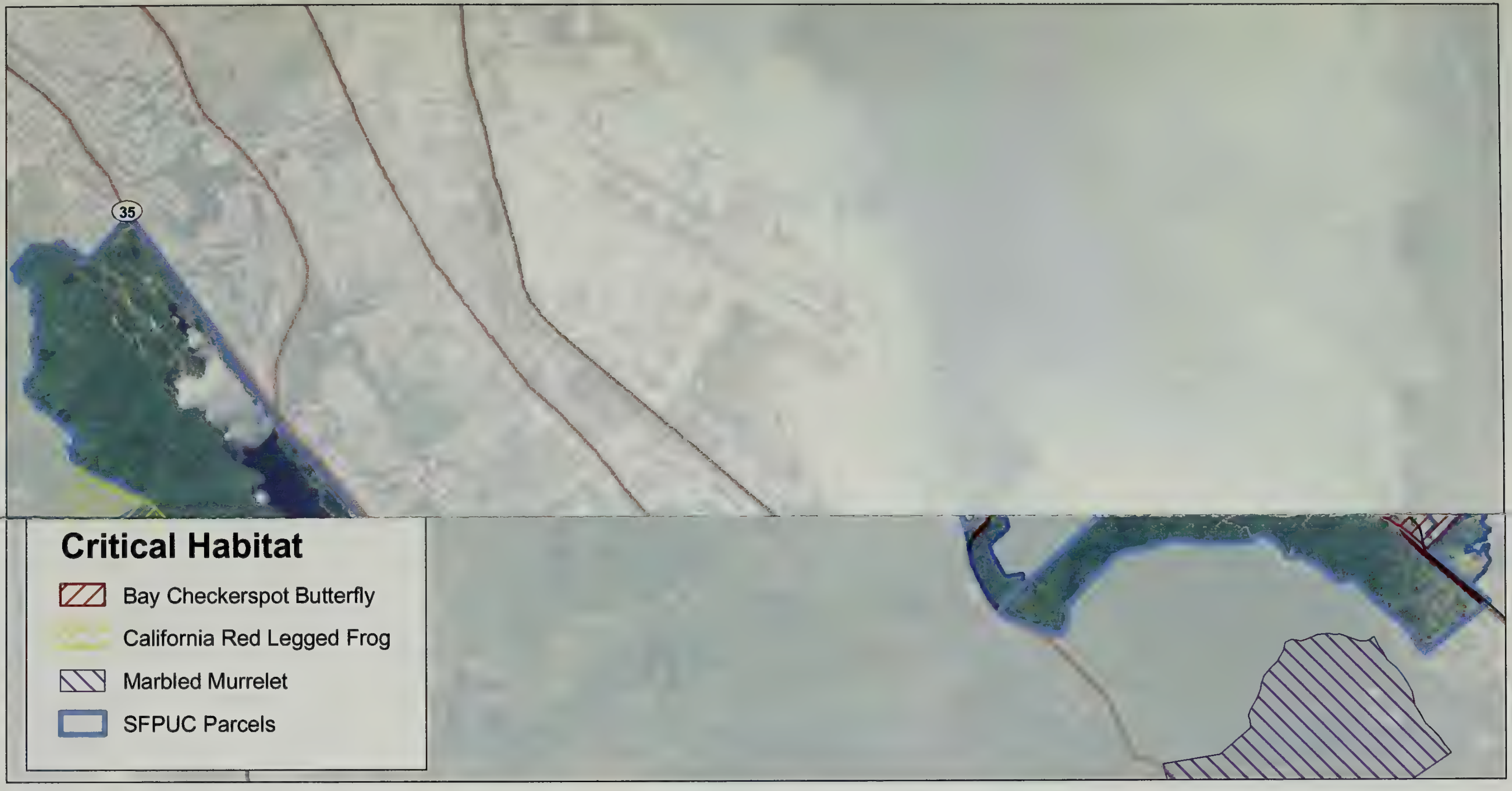
[7] "Take" is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct.

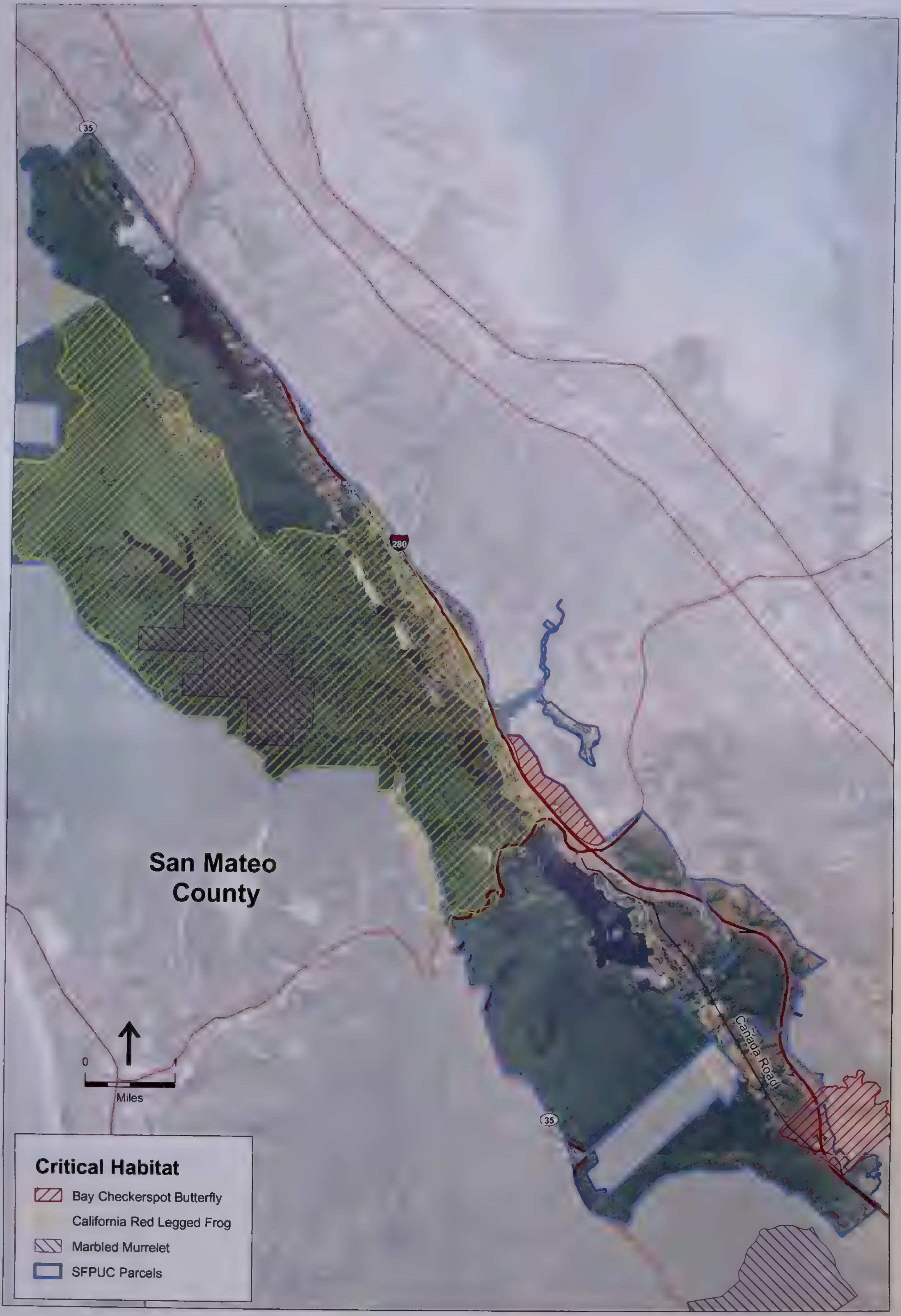


SOURCE: SFPUC, 2008; USFWS, 2009; DOA, 2005

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.13-3

Critical Habitat within the Project Area



SOURCE: SFPUC, 2008; USFWS, 2009; DOA, 2005

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.13-3

Critical Habitat within the Project Area

California Fully Protected Species

California law (Fish and Game Code Sections 3511, 4700, 5050, and 5515) allows the designation of an animal species as fully protected. This is a greater level of protection than is afforded by CESA because such a designation means the listed species cannot be taken at any time. Two animal species known or likely to occur within the project study area are designated as fully protected (Table 5.13-2): white-tailed kite and San Francisco garter snake.

California Native Plant Protection Act

The California Native Plant Protection Act (Fish and Game Code Sections 1900–1913) and the Natural Communities Conservation Planning Act provide guidance on the preservation of plant resources; these two acts underlie the language and intent of Section 15380(d) of the CEQA Guidelines. Vascular plants listed as rare or endangered by the CNPS (2001), but which have no designated status or protection under federal or state endangered species legislation, are defined as follows:

- List 1A: Plants presumed extinct
- List 1B: Plants rare, threatened, or endangered in California and elsewhere
- List 2: Plants rare, threatened, or endangered in California, but more numerous elsewhere
- List 3: Plants about which more information is needed – a review list
- List 4: Plants of limited distribution – a watch list

In general, plants appearing on CNPS List 1A, 1B, or 2 are considered to meet the criteria for endangered, threatened, or rare as laid out in Section 15380 of the CEQA Guidelines. Additionally, plants listed on CNPS List 1A, 1B, or 2 also meet the definition of Section 1901, Chapter 10 (Native Plant Protection Act) and Sections 2062 and 2067 (CESA) of the California Fish and Game Code. Numerous plant species listed on CNPS List 1A, 1B, or 2 might occur in the LCSDI project area (Table 5.13-1).

State Water Resources Control Board and San Francisco Bay Regional Water Quality Control Board

The State Water Resources Control Board (SWRCB) was created by the legislature in 1967. The mission of the SWRCB is to ensure the highest reasonable quality for waters of the state while at the same time allocating those waters to achieve the optimum balance of beneficial uses. This joint authority with respect to water allocation and water quality protection enables the SWRCB to provide comprehensive protection for California's waters.

The SWRCB has adopted a Statewide General Permit for Stormwater Discharges Associated with Construction Activity under the National Pollutant Discharge and Elimination System (NPDES) program. The permit is applicable to construction sites of one acre or more. A general permit was adopted because the board determined that issuing individual NPDES permits for construction projects was impractical. The permit also authorizes the discharge of water other than stormwater from a construction site, provided it does not cause or contribute to a violation of any water quality standard. To be covered by the general permit, an individual contractor must implement certain types of best management practices (BMPs) to meet water quality standards. The contractor must prepare a stormwater pollution prevention plan (SWPPP) that describes the BMPs and how they would be implemented at the construction site, both during construction and after construction is complete.

Under Section 401 of the federal Clean Water Act, states must certify that any activity subject to a permit issued by a federal agency (such as the Corps; see above) meets all state water quality standards. In California, pursuant to Section 401 of the Clean Water Act, the SWRCB considers that "waters of the state" include, but are not limited to, rivers, streams, lakes, bays, marshes, mudflats, unvegetated seasonally ponded areas, drainage swales, sloughs, wet meadows, natural ponds, vernal pools, diked bay lands, seasonal wetlands, and riparian woodlands. Under the Porter-Cologne Water Quality Control Act (Porter-Cologne), all waters of the United States that are within the borders of California are also waters of the state. Subsequent to the Solid Waste Association of Northern Cook Counties v. United States Corps of Engineers decision, the SWRCB has resulted in having sole jurisdiction over certain "isolated waters" that are not regulated by the Corps (SWRCB, 2002).

Most of the implementation of the SWRCB's responsibilities is delegated to the nine Regional Water Quality Control boards (RWQCBs). The nine regional boards take certification actions for activities subject to any permit issued by the Corps pursuant to Section 404 (or for any other Corps permit, such as permits issued pursuant to Section 10 of the Rivers and Harbors Act of 1899) and also for the NPDES general permit program. The proposed project falls within the jurisdiction of the San Francisco Bay RWQCB.

To be consistent with Executive Order W-59-93 (i.e., the California Wetlands Conservation Policy), impacts on waters of the state require mitigation that results in "no net loss" of wetland functions, acreage, and values of waters of the state. The policy also encourages regulatory flexibility to allow public agencies and water districts to create wetlands but later remove them if the wetlands are found to conflict with the primary purpose to which the property is devoted.

State and Federal Jurisdictional Waters within the Project Study Area

The total extent of federal jurisdictional waters in the project study area is 308.49 acres, which fall under state jurisdiction as well (see below). In addition, 1,033.61 acres of open water are under state jurisdiction only (see Appendix G of this EIR; Entrix/MSE, 2007).

Other Statutes, Codes, and Policies Affording Limited Bird Species Protection

Independent of the MBTA, birds of prey are protected in California under the Fish and Game Code (Section 3503.5, 1992). Section 3503.5 states that it is "unlawful to take, possess, or destroy any birds in the order Falconiformes (diurnal birds of prey) or Strigiformes (owls) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto." Disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to nest abandonment. The CDFG considers any disturbance that causes nest abandonment and/or loss of reproductive effort to be "taking." The loss of fertile eggs, the take of nesting raptors, or any activities resulting in nest abandonment would constitute a potentially significant impact. Substantial adverse project impacts on these bird species are considered potentially significant in this EIR if the species is known or has a high potential to nest on the site or rely on it for primary foraging. The federal Bald Eagle Protection Act prohibits persons within the United States (or places subject to U.S. jurisdiction) from "possessing, selling, purchasing, offering to sell, transporting, exporting or importing any bald eagle or any golden eagle, alive or dead, or any part, nest, or egg thereof." Project impacts on these species would not be considered significant unless the species are known or have a high potential to nest in the study area or rely on it for primary foraging.

Sensitive Natural Communities

Sensitive communities include those that are especially diverse, regionally uncommon, considered sensitive natural communities by the CDFG, or are otherwise covered by state, federal, or local regulations. The CNDDB tracks the status of sensitive natural communities throughout California. The CDFG has designated four natural communities in the project vicinity as sensitive: northern maritime chaparral, valley needlegrass grassland, valley oak woodland, and serpentine bunchgrass. Only one of these communities, serpentine bunchgrass, has been officially mapped in the project area.

California Department of Fish and Game Code Sections 1600–1616

Under Sections 1600–1616 of the California Fish and Game Code, the CDFG regulates activities that substantially divert, obstruct the natural flow of, or substantially change rivers, streams, and lakes. The jurisdictional limits of the CDFG are defined in Section 1602 of the California Fish and Game Code as the bed, channel, or bank of any river, stream, or lake. The CDFG regulates activities that would take place near any river, stream, or lake or result in the deposit or disposal of debris, waste, or other materials into any river, stream, or lake. Such activities require the project proponent to obtain a Streambed Alteration Agreement, in which the CDFG would provide measures for protecting fish and wildlife resources during conduct of the project.

5.13.2.3 Local Plans, Policies, and Ordinances

Local plans, policies, and ordinances are also considered in Chapter 4, Plans and Policies, and in Section 5.2, Land Use, of this EIR.

SFPUC Watershed Management Plan

In the *Peninsula Watershed Management Plan* (WMP), the SFPUC has articulated its policies regarding the protection and management of special-status species and other species of concern (SFPUC, 2002) and has summarized these policies in its field manual, *Watershed Land Protection Procedures* (SFPUC, 2001). SFPUC policy is to preserve, protect, and enhance significant botanical and wildlife resources, including rare, threatened, endangered, and sensitive species and their habitats, and to preserve biodiversity and genetic diversity of wildlife populations where possible. WMP policies are intended to balance environmental and water policy concerns and should be considered together (see Chapter 4, Section 4.2.2).

Prior to implementing facility and infrastructure projects, operations and maintenance activities, and construction projects, the WMP requires project proponents to perform a site-specific analysis to determine the presence of sensitive vegetation and wildlife and the potential effects of the activities on these resources. Analyses must be conducted in accordance with applicable state and federal laws, statutes, and guidelines.

Several WMP policies may be applicable to the LCSDI project:

> *Policy V3*: Prohibit the planting of exotic plant species.
>
> *Policy V4*: Reduce the occurrence of noxious weeds and invasive exotic plant species through eradication and control practices.
>
> *Policy V5*: Protect, preserve, and enhance significant botanical resources, including populations of rare, threatened, endangered, and sensitive plant species and their habitat.
>
> *Policy V6*: Encourage and allow investigations of special-status plants and communities on the watershed to further the SFPUC's understanding of the watershed's vegetation and its condition.
>
> *Policy V7*: Protect and restore unique, local, and/or indigenous plant species to maintain biodiversity and specialized habitat values.
>
> *Policy V8*: Preserve the biodiversity and genetic integrity of the watershed plant communities, where possible.
>
> *Policy V*: Protect, conserve, and enhance wetlands and riparian communities.
>
> *Policy V10*: Manage grasslands and rangelands to balance, wherever possible, the support of wildlife habitat values, the restoration of native perennial species, and the reduction of fuel loads and noxious weeds.
>
> *Policy V11*: Manage shrub communities to reduce fuel loads, prevent soil erosion and sedimentation, improve wildlife habitat access and use, and control invasive plants.
>
> *Policy V12*: Manage woodlands and forests to maintain healthy, vigorous, and diverse stands with a multiplicity of age and size classes.
>
> *Policy V13*: Give priority to restoring degraded habitat rather than creating new habitat, with the exception of sites for wetland mitigation banking where new wetland habitat should be created.
>
> *Policy V15, W9*: Require a site-specific analysis prior to proposed facility and infrastructure projects, operations and maintenance activities, and proposed construction projects to determine the presence of sensitive vegetation resources and the potential effects of the activity on the resource. Analyses shall be conducted in accordance with all applicable State and Federal laws, statutes, and guidelines.

Policy W1: Protect high Ecological Sensitivity Zones (ESZs), including host plant communities supporting populations of State and Federally listed animals, using sound scientific methods.

Policy W2: Protect, conserve, and enhance existing native wildlife populations and their habitat.

Policy W3: Preserve the biodiversity and genetic integrity of local wildlife populations, where possible.

Policy W4: Protect, conserve, and enhance ecosystems that provide important wildlife habitat values.

Policy W6: Maintain the integrity of the watershed creeks to retain their value as riparian ecosystems and wildlife corridors.

Policy WA26: All maintenance, operation, and construction activities shall incorporate Best Management Practices (BMPs), as applicable.

Policy AR1: Conserve, protect, and enhance the biodiversity, genetic integrity, and habitat of the watershed's aquatic resources.

Policy AR2: Protect special-status species and adhere to applicable State and Federal management regulations.

Policy AR4: Promote healthy, diverse, riparian and wetland vegetation to provide shade and cover necessary for fish spawning, rearing, and feeding areas.

Policy AR5: Minimize and where possible eliminate the introduction of chemicals (e.g. copper sulphate, chlorine, etc.) into reservoirs and streams to protect aquatic resources.

Policy AR7: Require a site-specific analysis prior to proposed facility and infrastructure projects and proposed construction projects to determine the presence of sensitive aquatic resources and the potential effects of the project on aquatic resources. Analyses will be conducted in accordance with all applicable State and Federal laws, statutes, and guidelines.

Policy AR8: Manage the watershed's aquatic resources in cooperation with State, Federal, and local agencies, and scientific institutions.

Policy AR9: Cooperate with stream management organizations to protect and enhance aquatic habitat of streams in the hydrologic watershed.

Policy AR11: Promote wetland mitigation banking to offset impacts on wetlands from SFPUC activities on SFPUC lands.

Habitat Conservation Plans

There are no adopted habitat conservation plans that cover the LCSDI project area.

San Mateo County General Plan and Significant Tree Ordinance

The San Mateo County General Plan (San Mateo County, 1986) governs land use planning and development in unincorporated San Mateo County, which encompasses over 30,000 acres of urban, rural, and permanent open space. The San Mateo County General Plan seeks to recognize and balance the different land use patterns, infrastructure needs, and circulation patterns of these various land uses while balancing the need to preserve San Mateo County's open space, natural resources, and agricultural lands.

The San Mateo County General Plan recognizes the Peninsula watershed as a unique area of open space that should be protected and retained for open space, wildlife, water supply, and recreational uses. The plan calls for continued cooperative agreements among the County, the City and County of San Francisco (CCSF), the State of California, and the Golden Gate National Recreation Area for management of the watershed.

The San Mateo County Ordinance Code, Part Three of Division VIII, protects "significant trees," defined as any live woody plant rising above the ground with a single stem or trunk with a circumference of 38 inches or more measured at 4.5 feet vertically above the ground or immediately below the lowest branch, whichever is lower.[8] Removal of such trees requires a permit and the planting of replacement trees. The CCSF considers local tree ordinances when determining the significance of impacts on biological resources.

5.13.3 Impacts and Mitigation Measures – Terrestrial and Wetland Resources

5.13.3.1 Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to biological resources, but generally considers that implementation of the proposed project would have a significant impact if it were to:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations or by the CDFG or USFWS;

- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the CDFG or USFWS;

- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including but not limited to marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;

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[8] A circumference of 38 inches is equal to a diameter of 12 inches. In forestry terminology, a diameter measured at a vertical height of 4.5 feet is termed "diameter at breast height," or dbh. In the impact discussion, the term "12-inch dbh or greater" is taken to mean all of the conditions described in this ordinance, including the method for determining the vertical height at which the measurement is taken (e.g., 4.5 feet above the ground or below the lowest branch, whichever is lower).

- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;

- Have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish[9] or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, or substantially reduce the number or restrict the range of an endangered, rare, or threatened species;

- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or

- Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved plan.

5.13.3.2 Approach to Analysis

For the purpose of this EIR, the definition of "substantial," as used in the significance criteria above, has three principal components, each of which contributes to the determination of impacts on biological resources and their significance:

- Magnitude and duration of the impact (e.g., substantial/not substantial)
- Uniqueness of the affected resource (rarity)
- Susceptibility of the affected resource to disturbance

The evaluation of significance must also consider the interrelationship of these three components. For example, a relatively small-magnitude impact on a state or federally listed species could be considered significant because the species is rare and believed to be very susceptible to disturbance. Conversely, a natural community such as California annual grassland is not necessarily rare or sensitive to disturbance, and thus a much larger magnitude of impact might be required to result in a significant impact. Impacts on biological resources are considered *significant* when project-related habitat modifications (e.g., development, introduction of non-native plant and animal species, increased human intrusion, barriers to movement, or landscape management) could reduce species populations to the extent that they become locally less numerous; impacts on habitats are considered *significant* when the habitats could not continue to support viable populations of associated plant and animal species as a result of project implementation. *Potentially significant* impacts are those that might not be sufficiently reduced through nondiscretionary regulatory standards (see below). For impacts determined to be either significant or potentially significant, the SFPUC would need to implement mitigation measures to reduce the potential level of an impact to less than significant.

This impact analysis is divided into two broad categories: Construction and Operations.

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[9] Fish are discussed in Sections 5.13.5 through 5.13.8.

Construction

Construction impacts on biological resources are the measurable effects that would occur within the project's construction "footprint" (i.e., the construction zone). The construction activities required to implement the LCSDI project could adversely affect creek and riparian resources along San Mateo Creek and other sensitive resources in the work and staging areas on top and at the base of the dam and at the Boat Ramp staging area. The existing stilling basin at the base of the dam would be replaced with a larger stilling basin, which would result in the loss of some wetland habitat, with potential direct impacts not only on wetlands but also on resident wildlife through crushing, entombing animals in their burrows, or displacing them to other areas where they could be exposed to increased predation. Grading and staging would remove vegetation, reducing available habitat for wildlife and causing potential mortality to wildlife. The existing Sampling Station #5 along the Pulgas Discharge Channel would be raised. Indirect impacts on both habitat and resident animals, especially frogs and snakes, could occur beyond the limits of the project footprint if construction were to result in increased sedimentation within local watercourses and affect downstream areas (see Section 5.15.3.4 in Section 5.15, Hydrology and Water Quality, for more detail).

Operations

Operational impacts on biological resources are those associated with the long-term operation of Crystal Springs Reservoir and the LCSD. Implementation of the project would allow the average water surface elevation within Crystal Springs Reservoir to be operated and maintained at higher levels than under current conditions. While the overall operations would be similar to the current operations, the SFPUC would operate the reservoir within a higher range of elevations and a slightly different pattern of inundation as the reservoir is drawn down and filled according to water system requirements (see Chapter 3, Project Description, Section 3.7).

As described in detail in Chapter 3, Project Description, Section 5.15, Hydrology and Water Quality, and in Appendix C (*Operations Before and After Lower Crystal Springs Dam Improvements Project),* the existing baseline condition is characterized by considerable variation in reservoir water surface elevations. Briefly, the proposed project would allow a 4-foot increase in the maximum normal water surface elevation, from 283.8 to 287.8 feet. The *average* elevation under project operations would increase by more than 4 feet (from about 276 to 281.5 feet, see Table 5.15-3 in Section 5.15, Hydrology and Water Quality), because the reservoir has generally been operated somewhat below the maximum allowed. The annual pattern of reservoir surface elevations would be about the same as under existing conditions, with the lowest elevations in the fall and early winter and the highest elevations in early summer. In the past, extended periods of very low reservoir surface elevations have occurred during multiple-year droughts and during interruptions of the Hetch Hetchy water supply due to system maintenance; this pattern is expected to continue with the proposed project, although the typical annual range of surface elevations could be somewhat narrower than in the past.

The analysis of operational impacts on biological resources is based on three elements:

- The proposed operations (described in Chapter 3, Project Description, Section 5.15, Hydrology and Water Quality, and Appendix C)
- A review of the literature on plant requirements for and tolerance of periodic and sustained inundation and documented field observations (see Appendices H and I)
- The methods used to predict the pattern of future reservoir surface elevations, including the changes associated with the increased maximum normal operating level and the occasional exceedances above that level (described in Section 5.15, Hydrology and Water Quality, and Appendix M)

Each plant and animal species is affected uniquely by changes in reservoir fluctuations and associated degree of inundation, each responding based on its own set of ecological requirements and tolerances. The result of the proposed future operations would be a complex series of changes in wetland and upland vegetation, as well as the wildlife that depend on these habitats. Under the proposed project, some wetland vegetation would be lost at lower elevations where the period of inundation exceeds the vegetation's ecological tolerance. Some wetland vegetation would be gained at the upper elevations where the duration of inundation would increase. In addition, some additional wetland vegetation is expected to form above the normal inundation zone because higher groundwater levels would "induce" suitable conditions for the development of wetlands. Thus, some upland vegetation would be converted to wetlands where inundation occurs frequently and long enough to support wetland vegetation. At elevations where the land surface is flooded occasionally, some flood-sensitive upland vegetation would be converted to more flood-tolerant upland species. In general, flood-sensitive species tend to be large, long-lived woody species such as trees, while flood-tolerant species include annuals as well as small, non-woody perennials such as herbs and grasses. In each of these predicted situations, individual species would respond both to changes in average reservoir conditions and to the extent and duration of extreme high and low reservoir elevations. Moreover, the current extent of any given species represents its response to recent and ongoing reservoir operations and therefore is constantly changing in response to a dynamic system. Because managed reservoir operations do not represent "natural" conditions, conventional habitat suitability models cannot be applied, and thus the predictions made in this analysis are based on relevant literature and professional judgment, and potential impacts are assessed against a baseline of high variability in a reservoir system that has been operating for more than 100 years.

5.13.3.3 Impact Summary

Table 5.13-3 presents a summary of potential impacts on terrestrial and wetlands resources.

TABLE 5.13-3
SUMMARY OF IMPACTS – TERRESTRIAL AND WETLANDS BIOLOGICAL RESOURCES

Impact	Significance Determination	
	LCSD Site	Sampling Station #5 Site
Construction Impacts		
Impact BI-1: Construction impacts on wetlands, aquatic resources, and riparian habitat.	SM	SM
Impact BI-2: Construction impacts on sensitive habitats, common habitats, and county-designated significant trees.	SM	LS
Impact BI-3: Construction impacts on special-status species – direct mortality and/or habitat effects.	SM	PSM
Impact BI-4: Construction water discharge effects on riparian and/or aquatic resources.	LS	N/A
Impact BI-5: Conflicts with local policies or ordinances protecting biological resources due to construction impacts.	SM	LS
Operational Impacts		
Impact BI-6: Operational impacts on wetlands and aquatic resources.	SM	N/A
Impact BI-7: Operational impacts on sensitive habitats, common habitats, and significant trees.	SM	N/A
Impact BI-8: Operational impacts on special-status species – direct mortality and/or habitat effects.	SM	N/A
Impact BI-9: Operational water discharge effects on riparian and/or aquatic resources.	LS	N/A
Impact BI-10: Conflicts with local policies or ordinances protecting biological resources due to proposed operations.	SM	N/A
Impact C-BI: Cumulative loss of sensitive biological resources during construction and operation.	PSM	PSM

B = Beneficial impact
N/A = Not Applicable or no impact
LS = Less than Significant impact, no mitigation required
SM = Significant impact, can be Mitigated to less than significant
PSM = Potentially Significant impact, can be Mitigated to less than significant
SU = Significant Unavoidable impact
PSU = Potentially Significant Unavoidable impact

5.13.3.4 Construction Impacts

Construction Impact Overview

As described in Chapter 3, Project Description, the LCSDI project consists of modifying various features at the top and toe of the LCSD, as well as the ancillary component of raising Sampling Station #5. On the top of the dam, the parapet wall would be permanently raised, and the spillway would be widened and its crest reshaped. Drainage at the top of the dam would also be improved. At the base of the dam, the stilling basin would be removed and replaced with a larger basin. Large rock (referred to as riprap) would be placed and grouted with concrete in the San Mateo Creek channel immediately downstream of the enlarged stilling basin to prevent erosion. The SFPUC would also raise the elevation of Sampling Station #5 at the Pulgas Discharge Channel, located about four miles south of the LCSD, so that the sampling equipment would not be inundated after dam improvements are completed and proposed modifications to reservoir operations are implemented. All major construction work is scheduled to occur in the nine-month period between March and November and would include up to six months of 24-hour-per-day construction. Construction activities would be confined to the dry season to the extent feasible, although it is expected that some work would continue into the beginning of the rainy season.

Proposed construction activities at the LCSD and sampling station sites would result in significant impacts on the biological resources in the project area. These biological resources are described above in Section 5.13.1, Setting – Terrestrial and Wetland Resources. The construction activities that could affect biological resources are summarized below and described in detail in Chapter 3, Section 3.6, Project Construction.

Construction Activities at the Top of the Dam

At the top of the dam, about 60 feet of the parapet wall would be demolished on each side of the spillway. The remaining parapet wall would be strengthened and raised by about 9 feet. The existing training walls that confine flow within the spillway and the supporting structure for the stoplogs would be demolished. The spillway opening on the upstream side of the dam would be widened from its current 88 feet to 208 feet. The existing stoplog system would be replaced by a new concrete crest that would permanently maintain the dam crest at an elevation of 291.8 feet. New training walls would be built to confine water within the new spillway and guide it over the dam. Construction activities would occur from both the north and south abutments of the dam, with temporary platforms built over the existing parapet wall to support the equipment. In addition, barges might be employed to provide access to the dam and facilitate construction activities at the top of the dam. During construction, it would be necessary to keep the elevation of the reservoir a few feet below the current maximum operating level in order to facilitate construction work on the top of dam and to minimize the risk of spills. Measures would be taken to prevent materials from falling into Crystal Springs Reservoir.

As part of the proposed drainage improvements to the dam, the existing pond and the entire top of the dam would be permanently drained, the depressed areas would be filled with crushed concrete, and drainage channels would be constructed to drain to the downstream face of the dam. Because the pond currently provides breeding habitat for the CRLF, any CRLF found in the pond on the top of the dam would be trapped and relocated to suitable habitat before construction begins, in accordance with approved protocols determined in consultation with responsible state and federal agencies.

Staging and storage areas at the top of the dam would require minor brush removal and some grading for parking and construction offices, but no trees would be removed. If the contractors determine that barges are needed to facilitate construction activities at the top of the dam, there would be need for the Boat Ramp staging area. The existing access road and boat ramp would be utilized to accommodate the barges and any equipment and supplies to be used with them.

Construction Activities at the Toe of the Dam

As part of the site preparation and clearing activities, a temporary access road for construction vehicles and equipment to enter and exit the stilling basin site would be constructed (see Chapter 3, Figure 3.6). To install this access road, it would be necessary to clear vegetation and trees along a 200-foot-long corridor through the riparian area and stream channel near the toe of the dam (between the existing access road near the Crystal Springs Pump Station and the site of the new stilling basin). Mature trees would be saved where feasible. The temporary engineered fill[10] road would be built in the cleared corridor; it would be about 35 feet wide at the base and 14 feet wide at the top, requiring about 600 cubic yards of engineered fill. The temporary road would be designed to minimize soil compaction of the wetland/riparian area and the potential for water quality impacts.

All trees and vegetation within the construction footprint of the new stilling basin and its associated riprap would also be removed. Vegetation would also be removed at Staging and Storage Area 1. It is expected that approximately 28 trees with a diameter at breast height (dbh) of 12 inches or greater would be removed, although the SFPUC would make decisions onsite with the contractors about which trees to remove. The SFPUC intends to save as many mature trees as possible.

Excavation and demolition of the existing stilling basin would be completed using tracked excavators. Broken concrete would be removed using an excavator or front-end loader, loaded into trucks, and hauled to a disposal site. The excavation would extend to bedrock. The material to be removed is expected to consist of sand and clay with some rock. Any rock encountered above the bottom elevation of the foundation would be removed using a rock breaker attached to the excavator arm. Tracked excavators might be used to remove material from the excavation and load it into trucks. Clean excavated material suitable for use as fill would either be used directly by another SFPUC project at the proposed new Crystal Springs Pump Station or stockpiled in the project area for later use. There is a potential that controlled detonations (blasting) could be used as an excavation/demolition method in the event that all other methods prove insufficient for the types of rock materials encountered or if needed to meet the scheduling requirements.

Prior to construction of the new stilling basin, the existing stilling basin area, Pool 1, and the intervening shallow channel/marsh section would be dewatered through the use of pumps. To minimize the potential for groundwater seepage into the basin, the contractor might also need to extract some groundwater in the immediate vicinity of the stilling basin. Prior to dewatering operations, Pool 1 would be isolated from the creek channel at the downstream end to prevent water from seeping back into the pool. The pumped water would be treated by settling, filtration, or other means prior to discharge into San Mateo Creek in compliance with the turbidity discharge limits of the San Francisco Bay RWQCB. For all dewatering operations, the pump's intake would be fitted with screens meeting CDFG and NMFS criteria to prevent effects on listed species. Qualified and permitted fish biologists would remain on site during the initial dewatering and would thus be available to rescue any fish found in Pool 1 prior to complete dewatering and relocate them to a suitable location within San Mateo Creek downstream of the construction site (see Fisheries, Sections 5.13.5 through 5.13.8).

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[10] Engineered fill is typically defined as a soil matrix that is nonhazardous, noncorrosive, free of organic matter (i.e., loam), well graded, and consisting of rocks or lumps less than 6 inches in greatest dimension. Engineered fill has a low expansion potential and is typically placed under controlled moisture and compaction conditions.

After demolition of the existing 102-foot-wide by 32-foot-long stilling basin, a new 154-foot-wide by 125-foot-long stilling basin would be built. A 20-foot section on the downstream side of the stilling basin would include grouted riprap. Immediately downstream of the stilling basin, an additional 20 linear feet of riprap grouted with concrete would be installed within the creek channel to further protect the creek bank and the structural stability of the stilling basin. There would be a total of 40 linear feet of grouted riprap, with 20 feet in the stilling basin and 20 feet in the creek channel. The proposed stilling basin and riprap apron would be in the same location as the existing stilling basin, but would extend into the immediately surrounding and downstream riparian habitat, including a portion of the perennial stream channel where there is standing water year-round. This reach of San Mateo Creek would be eliminated as part of construction of the new stilling basin and riprap apron.

Construction equipment and materials would be brought to the stilling basin site using the temporary access road that would extend into the creek channel. Concrete trucks would deliver ready-mixed concrete to the end of the access road, and it would be placed into the forms using boom-type concrete pumps. Riprap would be moved into place using an excavator or crane. Clean fill would be backfilled around the completed stilling basin structure.

The SFPUC would implement avoidance measures and restoration procedures and ensure minimal loss of the extent or function of waters of the U.S., waters of the state, or riparian habitat. These measures would include preparation of a SWPPP, as required by the RWQCB. SWPPP measures are detailed in Section 5.15, Hydrology and Water Quality, Section 5.15.3.6, under Mitigation Measure M-HY-3 (Preparation of a SWPPP).

Construction Activities at Sampling Station #5

At the Pulgas Discharge Channel, the existing sampling station would be detached from the channel and moved to one of the staging areas. Footings for the new steel-frame structure would be excavated using a backhoe and then constructed of concrete. The steel-frame structure would be erected on the newly constructed footings, and the sampling station would be mounted on the new frame.

Construction Staging Areas and Waste Materials

The work below the dam would produce approximately 22,000 cubic yards of excavated material consisting of soil, rock, and organic matter. An estimated 15,400 cubic yards of excavated material would be suitable for use as fill and would be stockpiled. The remaining 6,600 cubic yards of unusable excavated material would be trucked to an offsite disposal site. Stockpiled material would be used as backfill around the stilling basin.

Demolition at the top and toe of the dam would produce about 1,300 cubic yards of broken concrete. The concrete would be broken to drain-rock size and used to fill depressions in the top of the dam. About 950 cubic yards of broken concrete would be trucked to the landfill or recycled.

Temporary construction staging areas would be used for material and equipment staging, access, and storage. Staging and storage areas would be needed adjacent to the sites of the construction activities at both the top and toe of the dam. The areas would be used for construction offices, parking, and storage of equipment and materials. Seven such areas have been designated, with a total surface disturbance extent of 0.85 acre.

Summary

Special-status natural resources, including special-status species, wetlands, and other sensitive natural communities, are present at the top and toe of the LCSD, downstream in San Mateo Creek, and at Sampling Station #5 and Staging Area 9. These resources would be exposed to impacts from the types of construction-related disturbances described above. The effects of construction on these resources would generally be short term in nature and would include possible mortality, injury, or physiological stress resulting from site clearance (removal of vegetation), operation of construction equipment on site and vehicle traffic along roads, ground clearance, dewatering activities, and spills of toxic substances. Mitigation measures are identified in this section to reduce significant impacts on biological resources to a less-than-significant level. For instance, the first of these measures, Mitigation Measure M-BI-1a (Worker Training Program) is a program to communicate the LCSDI project commitments to the construction workers and contractor supervisors involved in on-the-ground project implementation; this mitigation measure is applicable to all construction impacts identified as significant or potentially significant.

Impact BI-1: Construction impacts on wetlands, aquatic resources, and riparian habitat.

Lower Crystal Springs Dam Vicinity

As described above under Construction Impact Overview, construction-related activities would affect jurisdictional waters of the U.S. and state and/or riparian habitats within and immediately adjacent to lower San Mateo Creek. During construction, the project would temporarily affect approximately 1.03 acres at the construction site around the dam, including 0.06 acre at the temporary access road and approximately 0.97 acre for temporary construction and access areas. Permanent impacts due to construction activities at the toe of the dam would total approximately 0.45 acre (i.e., 0.37 acre at the stilling basin and 0.08 acre for the riprap in the creek channel). The riparian component of the wetlands loss would be 113 linear feet of channel. In addition, 0.06 acre of artificial pond on top of the dam would be lost. The artificial pond is not considered jurisdictional waters of the U.S. and thus is not protected by the Corps, but the pond is used as breeding habitat by the CRLF. The temporary disturbance and permanent loss of jurisdictional wetlands within and immediately adjacent to lower San Mateo Creek and the permanent loss of CRLF habitat in the artificial pond would be *significant* impacts.

Grading, placement of riprap, temporary dewatering equipment, or other earthmoving activities within the boundary of jurisdictional waters would constitute "fill." During and after construction, rainfall could erode banks and result in the deposit of sediment within jurisdictional waters unless proper precautions are employed. Until the adjacent disturbed areas are revegetated, stabilized, and restored to preconstruction conditions, the new stilling basin and downstream riprap could temporarily erode the banks and expose the root masses of riparian vegetation; this would be a *potentially significant* impact.

The temporary engineered fill road built to allow access down into the creek for construction of the stilling basin, storage of construction equipment, and installation of riprap along the stream banks could have long-term effects with respect to soil compaction and water quality at the site, a potentially significant impact. If vegetation is not restored properly following construction, invasive plant species could become established in and near jurisdictional waters and their functional value could decrease. There would also be the potential for hazardous materials to enter jurisdictional waters as a result of vehicle refueling, machinery leaks, or spills of construction-related products such as adhesives, solvents, paints, and drilling and petroleum lubricants (this water quality impact is analyzed in Section 5.15.3.4 under Impact HY-3). The discharge of fill into state or federal jurisdictional waters, whether temporary or permanent, would be a *potentially significant* impact.

Implementation of Mitigation Measure M-BI-1a (Worker Training Program) would reduce these impacts by training workers on the value of the resources present in the project area and on impact avoidance in general. Mitigation Measure M-BI-1b (Avoidance and Restoration) would provide specific procedures for replanting vegetation and controlling sediment, such as through the placement of weed-free straw rolls and installation of silt fences. Mitigation Measure M-BI-1c (Wetlands Creation and Enhancement for Construction and Operational Impacts) identifies measures for creating and enhancing wetlands and riparian habitat elsewhere on the Peninsula watershed, or in nearby areas that support or are capable of supporting similar wetland types; implementation of this measure would result in no net loss of wetland function and value. In addition, Mitigation Measure M-HY-3 (Preparation of a SWPPP) calls for measures to prevent construction-related erosion, sedimentation, and water quality impacts. Taken together, implementation of these four mitigation measures would reduce the construction impacts on wetlands, aquatic resources, and riparian habitat to a less-than-significant level.

Staging and Storage Areas; Boat Ramp Staging Area (Staging Area 9)

Development of the staging and storage areas and at the Boat Ramp staging area would not result in any impacts to wetlands, aquatic resources, or riparian habitat. This potential impact is considered *not applicable*, and no mitigation is required.

Sampling Station #5 Vicinity

The raising of Sampling Station #5 would take place along the Pulgas Discharge Channel and immediately adjacent to the southern portion of Upper Crystal Springs Reservoir. The proposed new footings and access stair on the north side of the discharge channel would be located in non-jurisdictional areas of weedy, non-native vegetation at an elevation of 287.5 feet. The footings on the south side of the discharge channel would be located about 1 foot lower and immediately adjacent to riparian and lacustrine habitat. Temporary construction access to the southern side of the discharge channel, plus excavation, grading, and placement of the footings, could potentially result in the direct loss of riparian habitat and possible fill of jurisdictional wetlands, as well as erosion and sedimentation into the jurisdictional area. Temporary impacts on wetlands are estimated to affect about 50 square feet, or 0.001 acre.

The discharge of fill into state or federal jurisdictional waters, whether temporary or permanent, would be a *significant* impact. Implementation of Mitigation Measure M-BI-1a would reduce impacts by training workers on the value of the resources present in the project area and on impact avoidance in general. Mitigation Measure M-BI-1b provides specific procedures for replanting vegetation and controlling sediment, such as through the placement of weed-free straw rolls and installation of silt fences. Mitigation Measure M-BI-1c identifies creation and enhancement measures for wetlands elsewhere on the Peninsula watershed, or in nearby areas that support or are capable of supporting similar wetland types, a measure which would result in no net loss of wetland function and value. Mitigation Measure M-HY-3 calls for measures to prevent construction-related erosion, sedimentation, and water quality impacts. Taken together, these actions would reduce the impact on biological resources to a less-than-significant level.

Impact BI-2: Construction impacts on sensitive habitats, common habitats, and county-designated significant trees.

In this EIR, sensitive habitat is defined as any of the following:

- CDFG-recognized sensitive natural communities and oak woodlands
- Corridors for resident or migratory fish and wildlife species
- Native fish or wildlife nursery site

Lower Crystal Springs Dam Vicinity

Other than wetlands and riparian communities, there are no sensitive natural communities, as defined by the CDFG (see Section 5.13.2, Regulatory Framework), within the project construction area at the LCSD site.

The riparian habitat and other vegetation along San Mateo Creek provide a corridor for wildlife movement along the creek. Impacts on jurisdictional waters and riparian habitat are described above under Impact BI-1, and construction activity could affect their function. However, the dam and its abutments already present a terminus to the corridor, and the construction work would be clustered at its base. There would be no change in the ability of animals to move up and down the stream; therefore, corridor impacts are considered less than significant, and no mitigation is required. San Mateo Creek is also a corridor for migratory fish and a nursery for native fish, including steelhead (see Section 5.13.5, Fisheries).

Aquatic habitats could be affected if non-native invasive species were introduced via construction equipment such as barges. However, established watershed operations protocol calls for steam-washing all watercraft to prevent the introduction of invasive aquatic species.

It is estimated that 28 trees with a 12-inch dbh or greater would require removal (see Chapter 3, Section 3.6.3). The actual number, and the size and species of these trees, would be tallied during construction. Any tree with a 12-inch dbh or greater could qualify as a "significant tree" under the Significant Tree Ordinance of San Mateo County. Because removing these trees could conflict with a local ordinance that protects biological resources, this impact would be *significant*. Implementation of Mitigation Measure M-BI-2 (Tree Replacement) would ensure that each tree protected by the local ordinance and down to 4 inches dbh would be replaced, and, in combination with Mitigation Measure M-BI-1a (Worker Training Program) would reduce this impact to a less-than-significant level.

Any construction activity (e.g., equipment delivery and driving on the access road) at the Boat Ramp staging area if needed to launch and remove barges could affect serpentine grassland, which is found along both sides of the access road, on the upslope (eastern) side of the road within the proposed staging area, and on the low hill immediately to the west of the Boat Ramp itself, a *potentially significant* impact. For all staging and storage areas, implementation of Mitigation Measures M-BI-1a (Worker Training Program), M-BI-1b (Avoidance and Restoration), and M-BI-3g (General Avoidance Measures) would reduce the impact of the proposed use of Staging Area 9 on sensitive habitats to a less-than-significant level.

Sampling Station #5 Vicinity

Other than the impacts on jurisdictional wetlands and riparian habitats described in Impact BI-1 above, impacts on sensitive habitats and common habitats would be *less than significant* at this site, and no further mitigation is required.

Impact BI-3: Construction impacts on special-status species – direct mortality and/or habitat effects.

Lower Crystal Springs Dam Vicinity

Special-Status Species at Lower Crystal Springs Dam. On the top concrete surface of the LCSD, sediment and runoff from the dam surface and surrounding slopes have accumulated in an artificial pond, approximately 0.06 acre in extent. CRLF eggs and tadpoles have been observed in the pond regularly over the past decade. It is considered frog breeding habitat and SFGS foraging habitat. This pond would be temporarily affected during implementation of the Crystal Springs Dam Bridge Replacement project by San Mateo County prior to construction of the LCSDI project; the LCSDI project would remove the pond entirely, potentially resulting in mortality to eggs, tadpoles, and adult frogs. This would be a *significant* impact. No additional impacts on special-status plants in the staging areas near the top of the dam would occur.

Listed Special-Status Species below Lower Crystal Springs Dam. As noted above under Construction Impact Overview, the existing stilling basin at the toe of the LCSD would be demolished a new, larger one would be constructed, and riprap would be grouted with concrete and placed in the stilling basin and in the creek channel to armor San Mateo Creek downstream. There are no special-status plant species at risk in the construction area below the dam, but the use of heavy equipment in or adjacent to the San Mateo Creek drainage, the transport of personnel and equipment to the site, and the use of temporary storage or laydown sites would pose a direct threat of mortality or injury to both of the listed resident species, the CRLF and SFGS. This would be a *significant* impact.

Other Special-Status Species Impacts below the Dam. Construction activities in or near the waterways, including dewatering the construction zone, could kill aquatic-dependent animals and degrade habitat through potential effects on water quality. For terrestrial species, construction activities that would disturb the ground or remove vegetation and trees, such as excavation and vehicle/equipment movement, could kill animals or destroy habitat and, in the case of birds, destroy active nests. Project construction could also destroy the nests of bird species protected by the Migratory Bird Treaty Act. Tree removal in winter or spring and early summer could affect winter hibernacula or maternity roosts of the special-status bats (i.e., greater western mastiff or Pacific western big-eared bat). This potential for impacts on special-status species due to construction activities below the dam would be *significant*.

Mitigation Measure M-BI-1c identifies creation and/or enhancement of wetlands and riparian habitat elsewhere on the Peninsula watershed or in nearby areas that support or are capable of supporting similar wetland types; implementation of this measure would result in no net loss of wetland functions or values. Since these wetland/riparian areas would provide habitat for the CRLF and SFGS, implementation of this measure would result in no net loss of habitat as well. Mitigation Measure M-BI-3a (Frog Relocation) stipulates that red-legged frog tadpoles in the artificial pond be relocated to a suitable refugium prior to the commencement of work on the top of the dam. Mitigation Measure M-BI-3b (Exclusion Fence) requires that the construction site be fenced with exclusion fencing and that sensitive species be simultaneously relocated (subject to state and/or federal permits) from the fenced construction area below the dam. Mitigation Measure M-BI-3c (Biological Monitor) also requires maintenance of the fence and the periodic presence of an onsite biological monitor during construction. Mitigation Measure M-BI-3d (Preconstruction Surveys and Avoidance of Nesting Birds) stipulates actions that avoid nesting birds; Mitigation Measures M-BI-3e (Avoidance of Roosting Bats) stipulates actions that avoid roosting bats, especially maternity roosts; and Mitigation Measure M-BI-3f (Preconstruction Surveys and Avoidance of Woodrat Middens during Breeding) stipulates an action that avoids woodrat middens during the breeding season. Mitigation Measure M-BI-3g (General Avoidance Measures) provides protocols to minimize construction impacts on other wildlife. Taken together, and in combination with Mitigation Measures M-BI-1a (Worker Training Program) and M-BI-1b (Avoidance and Restoration), these actions would move individual animals out of harm's way, replace lost habitat, and ensure that avoidance measures are implemented through the presence of a biological monitor, thus reducing the impact to a less-than-significant level.

Staging and Storage Areas; Boat Ramp Staging Area (Staging Area 9). Use of the Boat Ramp staging area is expected to be limited to driving on the access road and temporary storage. However, use of this staging area, if required, could affect Crystal Springs lessingia, which is found along both sides of the access road, on the upslope (eastern) side of the road within the proposed staging area, and on the low hill and unvegetated shoreline immediately to the west of the Boat Ramp itself. This area also contains suitable habitat for the CRLF and SFGS, and these species would experience temporary habitat loss and potential mortality, a *potentially significant* impact. For all storage and staging areas, implementation of Mitigation Measures M-BI-1a (Worker Training Program), M-BI-1b (Avoidance and Restoration), M-BI-3c (Biological Monitor), Mitigation Measure M-BI-3d (Preconstruction Surveys and Avoidance of Nesting Birds), Mitigation Measure M-BI-3e (Avoidance of Roosting Bats), Mitigation Measure M-BI-3f (Preconstruction Surveys and Avoidance of Woodrat Middens during Breeding), and Mitigation Measure M-BI-3g (General Avoidance Measures) would reduce the impact of the proposed use of of Staging Area 9 on sensitive habitats to a less-than-significant level.

Sampling Station #5 Vicinity

Two special-status species, the CRLF and SFGS, are known to occur in the area near Sampling Station #5 and have been recently sighted nearby (ESA, 2001). Both species are assumed to be present in the project construction area. The willow riparian habitat is suitable for saltmarsh common yellowthroat, which has been recorded in the CNDDB as nesting in the willow stands northwest of the site.

Construction activities could result in the temporary loss of habitat for CRLF, SFGS, and saltmarsh common yellowthroat, but due to the limited area of construction and the short construction duration, the potential impact would be less than significant. However, construction activity could result in direct mortality of individuals, a *potentially significant* impact on CRLF and SFGS. Implementation of Mitigation Measures M-BI-1a (Worker Training Program), M-BI-1b (Avoidance and Restoration), M-BI-3c (Biological Monitor), M-BI-3d (Preconstruction Surveys and Avoidance of Nesting Special-Status Birds), and M-BI-3g (General Avoidance Measures) would reduce the impact of the proposed construction of Sampling Station #5 on special-status species to a less-than-significant level.

Impact BI-4: Construction water discharge effects on riparian and/or aquatic resources.

Lower Crystal Springs Dam Vicinity

The excavation for the stilling basin foundation would require dewatering throughout the construction period (see Chapter 3, Section 3.6.3). The existing stilling basin area, Pool 1, and the intervening shallow channel/marsh section would be dewatered through the use of pumps. Pumping would continue as necessary until construction of the stilling basin foundation is completed. The pumped water would be treated by settling, filtration, or other means prior to discharge into San Mateo Creek in compliance with the turbidity discharge limits of the RWQCB. Therefore, the impact of construction water discharges on riparian and/or aquatic resources would be *less than significant*, and no mitigation is required.

Dewatering is not expected to be necessary for development of the Boat Ramp or other staging areas. This potential impact is considered not applicable, and no mitigation is required.

Sampling Station #5 Vicinity

Dewatering is not expected to be necessary for construction of Sampling Station #5. This potential impact is considered *not applicable*, and no mitigation is required.

Impact BI-5: Conflicts with local policies or ordinances protecting biological resources due to construction impacts.

Impacts on trees protected by local ordinances that would be affected by construction activities at the LCSD site are *significant*, as discussed as part of Impact BI-2, above; but Mitigation Measure M-BI-2 (Tree Replacement) which would be implemented in conjunction with Mitigation Measure M-BI-1a (Worker Training Program) would reduce these impacts to less than significant. While many policies in the WMP address protection of biological resources from construction impacts, watershed facility maintenance and improvement are exempted from these policies to the extent necessary to achieve the SFPUC goal of delivering water to its customers.

5.13.3.5 Operational Impacts

Operational Impact Overview

The LCSDI project would allow greater flexibility and reliability in the operation of the SFPUC regional water system. Implementation of this project would allow the SFPUC to restore the historical storage capacity at Crystal Springs Reservoir and operate the reservoir at higher levels. For a more complete description of the past and projected future operations of Crystal Springs Reservoir, including projected changes in reservoir operating levels and changes in inundation frequencies at various elevations, refer to Section 5.15, Hydrology and Water Quality, Section 5.15.3.5, Operational Impacts, under the heading Operational Effects on Reservoir Levels.

No operational impacts on biological resources are expected to occur from raising Sampling Station #5, since post-project operations would be identical to current operations. Likewise, the Boat Ramp Staging Area (Staging Area 9) and other staging and storage areas would not cause impacts during the operational phase. Therefore, the impact analysis below does not include any further discussion of operational impacts associated with the future operation of Sampling Station #5 or the Boat Ramp Staging Area (Staging Area 9). The remainder of this analysis specifically addresses impacts resulting from proposed operation of Crystal Springs Reservoir following completion of improvements to the LCSD.

Review of Existing Reservoir Conditions as Related to Vegetation

Crystal Springs Reservoir has an annual pattern of filling in late spring, being drawn down until late summer or early winter, and being kept at relatively low elevations during the winter in order to maintain storage capacity to capture local runoff. Since 1983, Crystal Springs Reservoir has been required to maintain a maximum normal surface elevation of 283.8 feet, but the elevation can be raised to 287.8 feet with written DSOD approval when large storms are expected.

For the purpose of this EIR, reservoir operations during the period 2001 to 2006 were selected as the baseline period to best reflect the water level fluctuations that have resulted in the current pattern of vegetation/habitat types around the reservoir. The baseline period is characterized by substantial variation in reservoir surface elevations, similar to conditions during historical operations (see Figure 5.15-2, Crystal Springs Reservoir Historical Water Surface Elevations, in Section 5.15, Hydrology and Water Quality). During the baseline period, the average reservoir surface elevation was 275.5 feet; the highest elevation was 284.4 feet, and the lowest was 261.8 feet, a difference of 22.6 feet. Average annual reservoir elevations during the baseline period varied by more than 6 feet, from a low of 270.9 feet to a high of 278.1 feet. The range of reservoir elevations within a given year varied from a low range of 12.9 feet to a high range of 21.2 feet. The maximum water surface elevation that occurred since the DSOD restrictions were imposed in 1983 was 286.2 feet (for a brief period in 1983), and this elevation has not been exceeded since that time. During the baseline period, the DSOD-imposed maximum limit was exceeded for 21 days in 2003 and for the 14 days in 2006 immediately preceding the end of the baseline period.

Review of Proposed Operations as Related to Vegetation

With the proposed project in place, the SFPUC would operate the reservoir and LCSD in a manner similar to existing practices, except that the average annual water storage and average annual water surface elevation would both increase. The maximum normal operating elevation of the reservoir would be 4 feet higher than the current level, increasing from 283.8 to 287.8 feet. The modeled median reservoir elevation with the proposed project would be about 282 feet. The annual pattern of filling and drawdown would be similar to existing conditions, although it is expected that the average reservoir surface elevation would be closer to the maximum normal operating elevation. Similar to existing conditions, beginning no earlier than March 1, the SFPUC would begin to reduce the winter flood reservation and to raise the reservoir elevation to its maximum.

With the proposed project, the SFPUC could at times exceed the maximum normal surface elevation of 287.8 feet. During and following storm events, the reservoir elevation could rise up to an additional 4 feet, to a maximum of 291.8 feet, which corresponds to the historical design capacity of the reservoir and the permanent elevation of the proposed spillway. Based on SFPUC's proposed operations, as indicated in Chapter 3, Project Description, "exceedances" above 287.8 feet are assumed to occur no more frequently than two to three times per year and as often as every third year and to last for a period of up to 14 days.

According to modeled projections, maintaining the winter reservoir elevation at 283.3 feet would provide a storage capacity of 2 billion gallons. Exceedances could occur in the event of unexpected and very large storms, generally after March 1 when the SFPUC begins to reduce the winter flood reservation and the reservoir has begun to fill.

Predicted Effects on Wetland Habitats and Associated Upland Habitats Due to Increase in Maximum Normal Operating Level

Deviations in seasonal and annual hydrologic cycles from their "normal" regime (including stabilization of usually fluctuating regimes) can profoundly affect the structure of woody plant communities in wetlands (U.S. EPA, 2009). Raising reservoir operating levels would inundate a portion of the existing wetland habitats so that they are underwater too long to persist. To some extent, the wetlands would be converted to lacustrine habitat or open water. Some wetland habitats would persist, although their species composition could change due to the altered pattern of inundation. New wetland habitats would form within the new, higher fluctuation zone, at elevations currently supporting upland habitats. It is also expected that some wetlands would be induced or created at elevations above the normal reservoir operating elevations, as groundwater, seeps, and streams approach a new equilibrium with the higher groundwater table.

The water regime is extremely important to upland, wetland, and aquatic plant species, and the interactions are very complex. Timing, duration, water depth, and frequency of inundation are all critical factors in determining which species would persist in a certain area. Thus, beyond the effect of simply raising the reservoir water levels, the proposed future reservoir operations would result in changes in water-level fluctuations in response to future system storage and delivery needs, planned maintenance, drawdown to accommodate storms, etc. These changes would create an environment of alternating wet and dry periods around the reservoir's perimeter at a higher elevation than occurs at present and result in a slightly different pattern of inundation, both of which would have varying effects on different biological resources.

The EIR calculations of impacts on vegetation types and habitat are based on the following principles (for a more detailed discussion, see the Operational Impacts of the Lower Crystal Springs Dam Improvements Project on Vegetation and Habitat in Appendix J of this EIR):

> _The lower limit of upland vegetation is determined by the maximum reservoir elevations_. At a landscape (natural community) scale, the lower limit of upland vegetation is determined by inundation frequency. Observational data, when compared with the distribution of wetlands around the reservoir, indicate that the lower limit of upland woody vegetation corresponded to an inundation frequency of 5 percent. Therefore, under the proposed project, areas of woody upland vegetation with projected inundation frequencies greater than 5 percent are predicted to be permanently lost. Herbaceous upland communities extend down to elevations with an inundation frequency of 25 percent; thus, elevations with future inundation frequencies greater than this are predicted to be permanently lost.
>
> _The upper limit of wetland vegetation depends on wetland type_. The upper limit of wetland and riparian vegetation can be affected by seeps, springs, creeks, and groundwater independent of the reservoir, and not simply by the reservoir elevation alone. Herbaceous wetland vegetation was found in significant amounts well above the current reservoir maximum elevation, although *Scirpus/Typha* vegetation was generally found within the zone of regular inundation.
>
> _The lower limit of herbaceous wetland vegetation is determined by the fluctuation zone_. Project biologists found small amounts of herbaceous wetland at elevations with an inundation frequency as high as 100 percent. They concluded that, as a practical generalization, the lower limit of herbaceous wetland vegetation occurs 12 feet below the average operating elevation. This observation was applied to the predicted operational regime to estimate the lower limit of herbaceous wetlands under future with-project conditions (i.e., all existing wetlands more than 12 feet below the future average operating elevation are predicted to be permanently lost under the proposed project and would be converted to lacustrine habitat).
>
> _Existing wetlands within the projected future fluctuation zone are assumed to be retained, although their composition and structure could change_. It is assumed that slope and soil conditions that currently support wetland vegetation within the projected future fluctuation zone (i.e., no deeper than 12 feet below the future average operating elevation) would continue to do so in the future under the proposed operations.
>
> _Slope and inundation frequency determine whether upland habitats are converted to wetland or lacustrine/open water habitats_. Biologists found that wetland habitats generally occurred on slopes of 0 to 8 percent (steeper slopes are generally very rocky and have little soil development). Thus, it was predicted that under the proposed project, wetland habitats would form in newly inundated areas with low slopes, but not on steep slopes. The analysis for this EIR assumed that wetland habitats would form in areas with inundation frequencies of at least 5 percent and with slopes of 8 percent or less.

The net change in the affected vegetation types was predicted based on the above principles. The calculations were made by comparing current conditions with projected future conditions based on the results of a mathematical model that simulates regional water system operations based on the historical record of hydrology and meteorology; it relies on numerous assumptions to depict existing and future conditions (refer to Section 5.15, Hydrology and Water Quality, Section 5.15.3.5, Operational Impacts, under the heading Operational Effects on Reservoir Levels). The current inundation frequency was compared with the projected future inundation frequency in developing predictions for vegetation change.

Table 5.13-4 presents a summary of the predicted effects of the project on upland and wetland types and on waters of the State as a result of the proposed increase in the maximum reservoir operating elevation. Supporting details and assumptions used in these calculations are included in Appendix J, Operational Impacts of the Lower Crystal Springs Dam Improvements Project on Vegetation and Habitat.

In Table 5.13-4, "woody upland vegetation" refers to oak woodland, coastal scrub, and non-native woodland. In general, these habitats currently extend down to an elevation of 283 feet, which has a 5 percent inundation frequency. Direct loss of these habitats is predicted to occur up to the future 5 percent inundation frequency, at an elevation of 287 feet.

Grassland habitats, which tolerate inundation to a greater extent than woody upland habitats, currently grow down to an elevation of 279 feet, which has an inundation frequency of 25 percent. Direct loss of this habitat is predicted up to the future 25 percent inundation frequency, at an elevation of 286 feet.

In addition to these predicted direct losses of upland habitat, some loss of upland habitat is also predicted above the zone of frequent inundation. Groundwater levels near Crystal Springs Reservoir are closely tied to reservoir elevation. Groundwater levels in turn affect the flow of seeps and springs around the perimeter of the reservoir, and also influence the location and extent of riparian areas, which depend on sustained high groundwater levels at the mouths of tributary streams. As the average operating elevation would increase with the proposed project, groundwater levels would also rise, and the extent of wetland and riparian habitats above 283.8 feet is predicted to increase as a result. Based on the current proportion of riparian and wetland vegetation in the 4-foot elevation zone between the existing and proposed maximum operating elevation, an additional 25 percent of existing upland, both grassland and woody vegetation, is predicted to be converted to wetland habitat types.

Predicted Effect on Upland Habitats Due to Exceedances

Summary of Expected Exceedances. The proposed infrequent but periodic exceedances in the maximum normal reservoir level could affect existing upland vegetation around the perimeter of the reservoir at elevations above 287.8 feet and up to 291.8 feet.[11] An analysis of proposed future operations (see Project Description, Section 5.15, Hydrology and Water Quality, and Appendix C, *Operations Before and After Lower Crystal Springs Dam Improvements Project*) indicates that exceedances above 287.8 feet could occur about one year in three and no more than two or three times in a single year. Exceedances could occur any time in the rainy season but would primarily be expected to occur after March 1 when the SFPUC begins to eliminate the winter flood reservation as the rainy season ends.

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[11] Exceedances would be so brief and infrequent that they would not affect the extent of wetland vegetation; thus, this section only addresses impacts on upland vegetation.

TABLE 5.13-4

SUMMARY OF PREDICTED CHANGES IN EXTENT OF VEGETATION TYPES WITHIN THE INUNDATION ZONE DUE TO THE PROPOSED INCREASE IN MAXIMUM NORMAL OPERATING ELEVATION FROM 283.8 TO 287.8 FEET

	Vegetation/Land Cover (acres)										
	Upland Forest			Upland Scrub		Upland Herbaceous	Aquatic	Wetland			
Scenario	**Coast live oak woodland**	**Mixed evergreen forest**	**Non-native forest**	**Coastal sage scrub**	**Northern mixed chaparral**	**Grassland**	**Lacustrine/ unvegetated**	**Riparian**	***Scirpus/ Typha***	**Herbaceous wetland**	**Total (acres)**
Existing	48.0	18.5	5.0	26.4	0.3	30.1	30.2	81.5	21.5	227.1	488.6
Future, with project implementation	28.4	9.0	3.0	12.8	0.2	9.1	109.5	73.8	13.5	229.3	488.6
Net change	-19.6	-9.5	-2.0	-13.7	-0.2	-21.0	79.4	-7.7	-8.0	2.3	0
Total change in vegetation type	Total, all Upland Forest: -31.1 acres			Total, all Upland Scrub: -13.8 acres		Total, Upland Herbaceous: -21.0 acres[a]	Total, Aquatic: +79.4 acres	Total, all Wetland: -13.5 acres (including riparian)			

NOTE: See Appendix J for a detailed explanation of this table. Minor differences in total acreages due to rounding of calculated values to the nearest tenth.

[a] Of this acreage, 8.3 acres is serpentine bunchgrass and 12.7 acres is non-native grassland.

During the rainy season, the SFPUC maintains a winter flood reservation of about 2 billion gallons (lowering the water elevation to about 283 feet). With this flood reservation in place, the reservoir water elevation would not be expected to exceed 287.8 feet, except during storms with a return-period frequency of 50 years or greater; these occurrences are expected to be very rare. However, exceedances could occur as a result of smaller storms than the 50-year storm at times when the SFPUC is unable to maintain the full 2-billion-gallon flood reservation (e.g., during a continuous series of storms over the watershed or an operational problem) or when the SFPUC begins to fill the reservoir at the end of the rainy season (generally after March 1).

To estimate the likely frequency and magnitude of exceedances, a hydrological model was developed to estimate the volume of runoff produced by different size storms over the Crystal Springs Reservoir watershed and to predict the effect of the storms on storage and water levels in the reservoir (see Appendix M of this EIR for details). The model uses long-term precipitation data and rainfall intensity information available from the National Weather Service and the SFPUC's historical records. The model indicated that in the situations where the flood reservation in the reservoir is eliminated (e.g., during a continuous series of storms over the watershed, an operational problem, or after March 1 when the SFPUC begins to fill the reservoir at the end of the rainy season), a five-year return period storm would raise the water surface elevation in the reservoir to about 290.2 feet. The probability of a five-year storm occurring after March 1 (in March or April) was estimated to be about one year in 35. Thus, estimates of the likelihood of local storms large enough to result in exceedances when the winter flood reservation is not fully in place indicate that with a reasonable worst-case event, the elevation of about 290 feet could experience inundation for about three days once every 35 years.

The frequency of flooding at a given site due to exceedances, and consequently the degree of impact, depends directly upon elevation. In the event of an exceedance, the first foot above the maximum normal operating level would be the first to be flooded and the last to be exposed and return to an oxygen-rich environment when the reservoir is drawn down. By contrast, the uppermost foot of elevation would be inundated only by exceedances that occur when the reservoir has filled to the maximum height of the spillway (elevation 291.8 feet) and would be subject to the shortest inundation duration.

Thus, based on the projected frequency and magnitude of exceedances, forested areas in the elevation range of 288 to 289 feet would be subject to inundation for the longest period during an exceedance event, and, as a result, these areas would experience the greatest change in species composition, size and age class structure. Longer, extended exceedances would occur only as a result of very unusual events, such as 100-year storms or back-to-back 50-year storms in combination with the reservoir already being at its maximum normal elevation. Such instances are projected to be very rare. Based on an analysis of the likely frequency of various size storms to occur when the winter flood reservation is reduced and the proposed operations to restrict the duration of exceedances to no more than 14 days, exceedances rising to 290 feet elevation and lasting at least three days are predicted to occur no more often than a few times per century.

Sensitivity of Upland Plants to Flooding. The sensitivity of plants to flooding depends on a number of factors. Plants need oxygen to metabolize carbohydrates, and plant roots, which do not photosynthesize, require oxygen for all metabolic activity. Roots of upland plants obtain oxygen via gaseous diffusion through pores in the soil matrix.[12] During flooding events, oxygen in the soil is rapidly depleted. Deprived of oxygen, the roots of most upland plants become dormant or begin to die. As little as three days of flooding during the growing season can result in the loss of some woody vegetation through suffocation and the accumulation of compounds formed under anaerobic conditions, which are toxic to roots (U.S. EPA, 2009).

Flood tolerance varies greatly by plant species. Within the project area, riparian species such as willows have specific adaptations to intermittent flooding. California bay, which is often found along ephemeral watercourses, may have some tolerance to intermittent flooding. Madrone and Douglas-fir generally do not occur in areas with flooding or even extended periods of soil saturation, and therefore are considered flood-sensitive. Coast live oak sometimes grows in riparian or floodplain situations and may be slightly more tolerant, but it still is considered a flood-sensitive species.

Flood sensitivity also depends on several factors. In addition to the variation among species, warm ambient temperature and active plant growth create greater oxygen requirements for plants, making them more susceptible to root damage during the warm growing season. In a flood episode lasting many days during warm weather and active plant growth, sensitive trees can be killed almost immediately if the roots are extensively damaged and no longer provide sufficient physiological support for the aboveground portion of the tree. However, some flood-tolerant species may not fully recover from root damage for several years, even from relatively brief inundation episodes lasting a few days. Damaged roots provide an entry point for disease, which can weaken or kill the tree over a period of a few years, or even a decade.

Other factors affecting plants' sensitivity to flooding include the age, size, and general state of health of the plant, with young, small, healthy plants generally more tolerant of flooding than large, old, or diseased plants. For example, although coast live oaks are usually regarded as upland trees, they can grow on floodplains, and young, healthy trees can survive brief flood events during their relative dormancy in the cool winter months. Large, old, or unhealthy coast live oaks are more vulnerable, particularly during their period of active growth in spring and summer. Because of the great size of mature trees (relative to shrubs or herbs) within the project area, this analysis assumes that the most flood-sensitive species are trees, and the most sensitive individuals are large, mature trees.

Other Factors Affecting Oaks. Oak rot fungus (*Armillaria* sp.) is one of the most widespread pathogens afflicting coast live oaks and historically has been the proximal cause of death of coast live oaks already experiencing disease or stress. However, the rapidly spreading Sudden Oak Death fungus (*Phytophthora ramorum*) and other pathogens can also attack and kill a weakened tree. Although Sudden Oak Death may kill trees quickly, oak rot fungus typically kills a weakened tree over a period of several years. Thus, the full effect of infrequent flooding events may not be evident for several years following the flooding episode. Flooding episodes as frequent as several decades apart could considerably alter the structure and composition of forested communities within the project area, eliminating the large, mature trees—especially those belonging to flood-sensitive species—and potentially even converting tree-dominated communities to grasslands and shrublands dominated by more flood-tolerant species.

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[12] Wetland plants have evolved a variety of adaptations to conditions of periodic flooding and thus can tolerate soil saturation and flooding within the range of each species' ecological tolerance.

Predicted Conversion of Upland Habitats Due to Exceedances. The impacts on upland habitats above 287.8 feet due to periodic exceedances were predicted based on the methodology and assumptions presented in this section, and the results are presented in **Table 5.13-5**. As noted previously, this analysis assumes that exceedances rising to an elevation of 290 feet and lasting for at least three days would be very rare, and impacts on upland vegetation above 290 feet would therefore be minimal. For upland vegetation at or below 290 feet, exceedances could be frequent enough and of a duration that could result in tree mortality. Potentially affected forest acreage is estimated to consist of up to 12 acres of coast live oak woodland, 5.3 acres of mixed evergreen forest, and 1.8 acres of non-native woodland. Flood-intolerant species such as Monterey cypress and Monterey pine are likely to be lost, although blue gum eucalyptus stands are likely to tolerate a greater degree of inundation. This predicted change is conservative (i.e., on the high side) in that the exceedances might not be as frequent or lengthy as assumed in this analysis, and areas experiencing infrequent exceedances might not lose the forest entirely, but only the most flood-sensitive individual trees.

TABLE 5.13-5
SUMMARY OF PREDICTED IMPACTS ON UPLAND VEGETATION DUE TO OCCASIONAL EXCEEDANCES OF RESERVOIR LEVELS ABOVE ELEVATION 287.8 FEET

Community	Coast live oak woodland	Mixed evergreen forest	Non-native forest	Shrub-dominated communities	Grasslands
Predicted extent of impacts	287 to 290 ft.	287 to 290 ft.	287 to 290 ft.	Expected to persist	Expected to persist
Acreage of predicted impact	12.0	5.3	1.8	–	–
Degree of impact	Significant	Not significant	Not significant	Not significant	Not significant
Mitigation required?	Yes, enhancement, conservation, or restoration	None required	None required	None required	None required

These tree-dominated habitats are predicted to be converted to grass- and shrub-dominated communities comprised of more inundation-tolerant species. This analysis predicts that the resulting vegetation is likely to be similar to surrounding native-dominated natural communities and could be either grass-dominated or shrub-dominated, depending on site conditions such as soil type, slope, and aspect (i.e., the direction of slope, such as south-facing or west-facing).

This analysis further predicts that exceedances would have a negligible impact on grasslands and shrublands, as shown in Table 5.13-5. Existing grasslands are found at inundation frequencies as great as 25 percent, so brief inundation caused by exceedances would be expected to have no effect on the extent of this habitat, and it is expected that species composition would be unaffected as well. The extent of shrub-dominated habitat is predicted to remain unchanged, although areas with frequent flooding due to exceedances could experience a shift in composition toward more tolerant species. Of these impacts, the loss of oak woodland would be significant because of its habitat value to wildlife and its declining extent locally and regionally. Oak woodland impacts are discussed under Impact BI-7 below. Impacts on mixed evergreen forest would not be considered significant because the resource is common and widespread in the region.

Impact BI-6: Operational impacts on wetlands and aquatic resources.

Following the completion of LCSDI project construction, proposed future operation of Crystal Springs Reservoir would result in an estimated net loss of 13.5 acres of wetlands. As described under Operational Impact Overview, this net loss is the result of two elements: first, the loss of wetland habitat at lower reservoir elevations where inundation frequency would become so high that annual seasonal wetland would not be expected to persist; and second, an increase in wetland habitat at higher reservoir elevations where inundation frequency would become high enough to support wetlands (see Table 5.13-4, above, and Appendix J for details).

The riparian component of the loss would be 7.7 acres, or 1,357 linear feet along tree-dominated tributary streams entering Crystal Springs Reservoir, such as Laguna Creek, San Mateo Creek, Adobe Gulch, San Andreas Creek, and other, unnamed tributaries. Other components of the total wetland impact would be a loss of 8.0 acres of Scirpus/Typha and a gain of 2.3 acres of herbaceous wetland. The total net loss of 13.5 acres of wetlands would be considered a *significant* impact. Other impacts are predicted to occur above the proposed maximum operating elevation (e.g., a change in the location of surface features such as serpentine seeps). Mitigation Measure M-BI-1c (Wetland Creation and Enhancement for Construction and Operational Effects) would ensure that there would be no net loss of wetland function or value due to reservoir operation. Mitigation Measure M-BI-1c (Wetland Creation and Enhancement for Construction and Operational Effects) lists the criteria for identifying these wetlands, and cites as examples several areas the SFPUC has designated for a "habitat reserve." Implementation of this measure would be accompanied by all other applicable mitigation measures, including Mitigation Measures M-BI-1a (Worker Training Program), M-BI-1b (Avoidance and Restoration), and mitigation measures that deal with avoidance of special-status species (see Impacts BI-7 and BI-8 and their associated mitigation measures, below).

Implementation of these measures, including monitoring to ensure successful performance of the proposed compensation wetlands, would reduce this impact to a less-than-significant level.

Impact BI-7: Operational impacts on sensitive habitats, common habitats, and significant trees.

Serpentine Bunchgrass

Serpentine bunchgrass is the only CNDDB-identified sensitive upland habitat present within the potentially affected inundation zone under future, with-project operations.[13] To be conservative, all grasslands on Obispo clay soil (formed over a serpentinite substrate) are assumed to support serpentine bunchgrass grassland. Fagan loams, which belong to the same soil association but are formed primarily over marine sandstone, often support similar native grasslands that contain special-status serpentine endemic species. Half of the acreage of Fagan loam grassland was assumed to support serpentine bunchgrass. Using this estimation, it was determined that approximately 8.3 acres of serpentine bunchgrass in the inundation zone (i.e., below the predicted 25 percent inundation frequency), plus grasslands lost to induced wetlands, would be affected by proposed reservoir operations; the loss of this sensitive natural community would be a *significant* impact. Mitigation Measure M-BI-7a (Serpentine Grassland Enhancements) would improve and maintain at least 10 acres of serpentine grasslands at the Boat Ramp South site[14] or an equivalent site. Implementation of this measure, along with all applicable measures to minimize habitat loss and mortality of special-status and other species, would reduce this impact to a less-than-significant level.

Oak Woodlands

For the purpose of this EIR, oak woodlands are considered a sensitive habitat because of their habitat value to wildlife and their declining extent locally and regionally. As discussed under the Operational Impact Overview, above, the increase in maximum normal operating levels of Crystal Springs Reservoir to 287.8 feet, plus the conversion of some oak woodland habitat to wetlands as a result of rising groundwater, is predicted to result in a potential loss of 19.6 acres of coast live oak woodland (see Table 5.13-4); this would be a significant impact.

In addition, the proposed short-term exceedances of reservoir water levels above 287.8 feet are predicted to result in a potential loss of, or significant effects on, additional oak woodlands at elevations up to 290 feet. After accounting for the potential conversion of a portion of oak woodland to wetland habitat in this elevation range, the extent of oak woodlands potentially affected by exceedances would be 12 acres, a significant impact. This prediction is based on the predicted frequency and duration of exceedances described in the project description, the operations memorandum (Appendix C of this EIR), and the impact overview presented above.

Taken together, the total potential loss of oak woodland (from the increase in average operating reservoir elevations and from exceedances) could be up to 31.6 acres, a *significant* impact.

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[13] Serpentine bunchgrass was not mapped during initial biological resource studies of the project area, but this analysis found that sufficient characteristics of this natural community were present in some areas containing serpentine-associated soils and supporting a high proportion of native grass and herb species.

[14] The Boat Ramp South site contains 35 acres, of which 10 acres were considered suitable for serpentine bunchgrass enhancement.

Mitigation Measure M-BI-7b (Oak Woodland Mitigation Program) establishes a commitment by the SFPUC to locate areas within the region where a comparable acreage of oaks could be planted and oak woodlands restored; specifies the components and implementation of a site (silvicultural) plan; and identifies success criteria for determining whether the mitigation has been successful. The measure also provides a second form of mitigation —conservation or preservation of existing oak stands or contribution to funds established to conserve oaks—which the SFPUC would implement in conjunction with the planting program. Overall, the mitigation measure is intended to provide replacement of lost oak woodland functions and values. Thus, the operational impacts on oak woodlands would be reduced to less than significant with implementation of this measure.

Common Habitats

Increasing the average operating elevation of Crystal Springs Reservoir would result in the conversion of some common upland habitats to wetland habitats or open water. Mixed evergreen forest is predicted to lose 9.5 acres due to the rise in maximum reservoir operating levels, and potentially an additional 5.3 acres due to periodic exceedances (a total of 14.8 acres). Non-native woodland is predicted to lose 2.0 acres due to the rise in maximum reservoir operating levels, and potentially an additional 1.8 acres due to periodic exceedances (a total of 3.8 acres). Upland scrub, primarily coyote bush scrub, is predicted to lose 13.8 acres due to the rise in maximum reservoir operating levels. Non-native grassland is predicted to lose 12.7 acres due to the rise in maximum reservoir operating levels. However, the net loss of upland scrub and non-native grassland would be less, because any forest types lost as a result of periodic exceedances would be converted to scrub or grassland types. These habitats are common within the region, and their loss is considered *less than significant.*

Impact BI-8: Operational impacts on special-status species – direct mortality and/or habitat effects.

Table 5.13-6 presents a summary of predicted impacts on special-status plants.

Fountain Thistle and Marin Western Flax

Populations of two federally and state-listed plant species, fountain thistle and Marin western flax, are present in the project area and extend into the projected, future inundation zone that would occur under proposed operations of Crystal Springs Reservoir. The frequent inundation that would occur below the proposed maximum normal elevation under future operations would likely render the area within the inundation zone unsuitable for fountain thistle and Marin western flax, and result in a loss of 0.30 acre of fountain thistle and 0.002 acre of Marin western flax. This would be a *significant* impact.

TABLE 5.13-6
SUMMARY OF PREDICTED IMPACTS ON SPECIAL-STATUS PLANTS

	Special-status species (acres)						
Scenario	**Fountain thistle**	**Marin western flax**	**Crystal Springs lessingia**	**Western leatherwood**	**Franciscan onion**	**San Francisco collinsia**	**Arcuate bush mallow**
Existing (below 291.8-foot elevation)	0.56	0.02	5.67	0.09	0.12	0.01	0.02
No change (no predicted impact)	0.26	0.02	3.08	0.00	0.10	0.00	0.02
Predicted loss	0.30	0.002[a]	2.59	0.09	0.02	0.01	0

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[a] Shown to three significant figures to illustrate actual predicted losses. All other values are assigned two significant figures.

The impact resulting from the potential loss of habitat for listed species due to exceedances or infrequent periodic increases in water levels (from 287.8 to 291.8 feet) is considered less than significant. This elevation interval supports the majority of listed plant acreage within the project area, (0.26 acre of fountain thistle and 0.021 acre of Marin western flax). The inundation during the exceedance periods would be very brief and infrequent. These species both occupy available habitat down to the current year's high water level, and would be expected to do so in the future; thus, potentially affected acreage was based only on the rise in the maximum operating elevation to 287.8 feet and not on the exceedances.

Mitigation Measure M-BI-7a (Serpentine Grassland Enhancements) would improve habitat for fountain thistle and Marin western flax at the Boat Ramp South site or an equivalent location and would include removing the mature Monterey pines that reduce the site's suitability for these species. Mitigation Measure M-BI-8a (Listed and Nonlisted Special-Status Plants) describes contingency actions in the event the measures at the enhancement site are not successful. These actions comprise creating an enhanced or restored habitat to fully compensate for the impact (i.e., to achieve no net loss of these species, as determined in consultation with natural resource permitting agencies). Implementation of these measures, along with Mitigation Measure M-BI-1a (Worker Training Program) and all relevant measures to reduce habitat loss in general and mortality to special-status species, would reduce the impact to a less-than-significant level.

Other Special-Status Plants

Impacts on other nonlisted special-status plants are listed below by the number of acres in the inundation zone below the proposed maximum normal operating elevation (287.8 feet). This occupied habitat is predicted to be lost as a result of the increase in maximum reservoir operating elevation.

- Crystal Springs lessingia: 2.59 acres

- Western leatherwood: 0.09 acre
- Franciscan onion: 0.02 acre
- San Francisco collinsia: 0.01 acre

Special-status plant losses due to exceedances are not expected to result in substantial mortality or a long-lasting reduction in populations because these species are small in stature and are annuals or relatively short-lived perennials. In addition to fountain thistle, noted above, Crystal Springs lessingia has been observed to grow down to the reservoir's maximum operating elevation, despite the fact that this elevation varies from year to year (Leitner, 2009). Since the periods of inundation would be brief and infrequent, the potential impact on special-status plants from exceedances above 287.8 feet is considered negligible. For Crystal Springs lessingia and Franciscan onion, occupied habitat within the project area was greater above 287.8 feet than below; thus, within the project area, only a fraction of the occupied habitat for these species would be affected. No impacts are predicted for arcuate bush mallow, which had mapped populations only above the 287.8-foot contour.

The impact resulting from the potential loss of all of the special-status plants due to exceedances would be less than significant. Loss of the populations of six special-status plants—fountain thistle, Marin western flax, Franciscan onion, Crystal Springs lessingia, western leatherwood, and San Francisco collinsia—due to the increase in maximum operating reservoir elevations would be a *significant* impact.

Mitigation Measure M-BI-7a (Serpentine Grassland Enhancements) would improve habitat for fountain thistle and Marin western flax as well as Crystal Springs lessingia at the Boat Ramp South site or an equivalent location and would include removing the mature Monterey pines that reduce the site's suitability for these species. Mitigation Measure M-BI-8a (Listed and Nonlisted Special-Status Plants) describes contingency actions in the event that the measures at the enhancement site are not successful in creating or restoring habitat for all plants, including Franciscan onion, western leatherwood, and San Francisco collinsia. These measures will ensure that the SFPUC will fully compensate for these impacts to achieve no net loss of habitat functions and services, as determined in consultation with natural resource permitting agencies. If identified compensation sites are not suitable for these species, habitat enhancement would be carried out at appropriate nearby sites. Implementation of these measures, along with Mitigation Measure M-BI-1a (Worker Training Program) and all relevant measures to reduce habitat loss in general and mortality to special-status species, would reduce the impact to a less-than-significant level.

Western Pond Turtle, San Francisco Garter Snake, and California Red-Legged Frog – Direct Mortality

For normal operations, there would not be a significant change from the baseline with regard to direct mortality for the WPT, SFGS, or CRLF. All three species are associated with ephemeral and rapidly changing water levels in their natural breeding, foraging, and adjacent upland habitats. The proposed future operations of the reservoir would simply move these environmental variables and replicate them at a higher elevation, palliated by the fact that increases in water elevation would be gradual (i.e., the transition to the higher operating levels would occur over a period of three years; see Chapter 3, Project Description, Section 3.7), which would allow the species and their habitat to acclimate to the higher levels. Also, at these higher levels there would be a conversion of sage scrub to grasslands, which may also benefit the species. The impact is considered less than significant.

Exceedances present a different but less predictable scenario. While the more mobile CRLF are not a concern, the more rapid increases in reservoir elevations that are likely to occur during the winter could put hibernating snakes at risk. The location of SFGS hibernation is crucial in determining the potential impact of exceedances. Most species and subspecies of garter snakes are described as being gregarious, and some species are reported to hibernate in large numbers, sometimes traveling long distances to suitable upland hibernacula. Without knowing SFGS behavior regarding the selection of hibernation sites, the actual impact (number of individuals affected) is not possible to predict.

Due to their evolution in temporary sag ponds, the SFGS may have evolved behaviors that lead them to select their refugia at elevations that are higher than those in which they breed and forage. The moderate climate of the Bay Area is also a factor, as there are rarely extreme cold temperatures and almost never freezing temperatures. SFGS are seen abroad during all months of the year in their range because of the mild climate. They have been seen actively foraging in February at Tracy Lake and at Mori Point habitat sites (Swaim, 2009). This could allow the SFGS in burrows to react to flooding by moving out of the rising waters.

Within the limitations of best professional judgment, a net decline in SFGS productivity must be considered a possibility; therefore, the impact of exceedances on SFGS would be considered *potentially significant*. While it is unlikely the flooding would actually cause direct mortality, snakes that exit a winter retreat could be exposed to an increased risk of predation. Mitigation Measure M-BI-8c (Predator (Bullfrog) Control), which would require draining permanent ponds and capturing and removing mature bullfrogs, would offset such a potential decline and reduce the impact to a less-than-significant level.

Western Pond Turtle, San Francisco Garter Snake, and California Red-Legged Frog – Habitat Effects

The rise in water levels in the reservoir under proposed future operations would result in an increase in the area where predatory fish occur. This increase in water levels, with resulting risk to CRLF and SFGS, would be a *potentially significant* impact in terms of habitat quality. However, compensatory habitat for all three species would be developed under Mitigation Measure M-BI-1c (Wetland Creation and Enhancement for Construction and Operational Effects).

Net wetland loss due to the proposed project is described under Impact BI-6, above, and would also be mitigated with implementation of Mitigation Measure M-BI-1c (Wetland Creation and Enhancement for Construction and Operational Effects). The overall effect, assuming implementation of this measure, would offset the loss of aquatic habitat used by the WPT, SFGS, and CRLF. No further mitigation is required to reduce impacts to a less-than-significant level.

However, proposed future reservoir operations would result in a loss of 34.8 acres of upland refugia (shrub and grasslands, see Table 5.13-4), a *potentially significant* impact. To some extent, this loss of shrub and grassland habitat would be offset by the expected development of grass- and shrub-dominated habitats where existing woodland and forest habitats are lost because of exceedances. Since the wetlands would remain intact in the exceedance zone and the upland refugia availability could increase where non-native woodland stands are eliminated, there is no loss predicted, and potentially a small gain in the amount of suitable habitat for these and other wetland-associated special-status wildlife species. Implementation of Mitigation Measure M-BI-8b (Shrub and Grassland Enhancement for Upland Refugia) would mitigate the loss with enhancement of shrub and grasslands in the project vicinity to a less-than-significant level.

Other Special-Status Species – Habitat Effects

Impacts on other animal species that are not listed but still considered special status (i.e., those species in Tables 5.13-1 and 5.13-2 either known or likely to occur in habitats within the future inundation zone habitats) could occur due to the increase in maximum reservoir operating levels and potential habitat loss. However, the effects on these animal species would be mitigated through the proposed gradual increase in water elevation over a period of three years, which would allow the species to acclimate to the higher levels as suitable habitat develops (see Chapter 3, Project Description, Section 3.7). The rise in reservoir elevation due to exceedances is not expected to affect other special-status species, such as those potentially breeding along the reservoir edge, because short-term rises in reservoir elevation also occur regularly under current conditions. Therefore, this impact would be *less than significant.*

Additional habitat losses due to periodic exceedances between elevations of 287.8 and 290 feet would only include oak woodland, and this impact would be mitigated through implementation of Mitigation Measure M-BI-7b (Oak Woodland Compensation).

Impact BI-9: Operational water discharge effects on riparian and/or aquatic resources.

Under the proposed operations, water managed within the reservoir, in pipelines, or released from the Crystal Springs Reservoir to San Mateo Creek would be from the same source and of the same quality as water under current conditions. Leakage and seepage at the dam is predicted to be slightly higher with the project, slightly increasing dry-weather flow, but would be inconsequential in relation to wet-weather flow in lower San Mateo Creek. Operation of the project would have no effect on the wet-weather flow regime of the creek. Overall, operation of the proposed project would not substantially change the flow regime along lower San Mateo Creek. Long-term maintenance of the LCSD and stilling basin would be generally similar to current practices, but would also include cleaning and pumping standing water from the stilling basin twice a year (see Chapter 3, Project Description, Section 3.7.3). Pumped water would be routed to a storage tank located away from the creek channel to allow the water to settle before it is released back to San Mateo Creek; all discharges would conform to applicable water quality standards. Therefore, impacts on downstream riparian and/or aquatic resources would be less than significant.

Significant habitat losses due to periodic exceedances between 287.8 and 290 feet would only include oak woodland, which is discussed above under Impact BI-7, and there would be no wetland or riparian losses. Thus, operational effects under this impact category would be *less than significant*.

Impact BI-10: Conflicts with local policies or ordinances protecting biological resources due to proposed operations.

As described above, proposed future reservoir operations would raise the maximum normal operating levels, increase the inundation frequency in existing upland habitat, and result in the loss of woody upland vegetation. This would include the loss of mature trees, including trees considered "significant" under the San Mateo County Significant Tree Ordinance, which would be a *significant* impact. However, for operational impacts, consistency with the San Mateo County Significant Tree Ordinance could be achieved programmatically. Tree-by-tree mitigation is infeasible at this scale, and the described program of compensation (see Mitigation Measure M-BI-7b, Oak Woodland Compensation) would accomplish the same purpose by creating the compensatory acreage amount and maintaining the biological function of oak woodlands at risk in the inundation zone. Implementation of Mitigation Measure M-BI-7b would reduce this impact to a less-than-significant level.

5.13.3.6 Mitigation Measures – Terrestrial and Wetlands Resources

Mitigation Measure M-BI-1a: Worker Training Program.

This measure is applicable to all construction impacts (Impacts BI-1 through BI-5). A worker awareness program (environmental education) shall be developed by a qualified biologist and implemented by a qualified biologist or environmental inspector to inform project workers of their responsibilities regarding sensitive resources that are present in the project area. The program shall comply with the following measures:

- The program shall be developed by a biologist familiar with the special-status biological resources that could occur in the project area. The training program shall be approved by a SFPUC staff biologist prior to implementation, if prepared by a consulting biologist.

- This program shall include training for all construction personnel before any work occurs in the project area, including equipment mobilization, vegetation clearing, or site grading. If new construction personnel are added to the project, the contractor shall ensure that new personnel receive training before they start working. The subsequent training of personnel can include a videotape of the initial training and/or the use of written materials rather than in-person training by a biologist.

- The training shall provide educational information on the natural history of the special-status species that could occur in the area, how to identify the species, as well as sensitive biological resources such as wetlands, riparian vegetation, and trees. The presentation shall review required mitigation measures (especially those included under Mitigation Measure M-BI-3g, General Avoidance Measures) to avoid impacts on the special-status resources, and penalties for noncompliance with biological mitigation requirements. The training shall also provide information regarding the importance of preventing the spread of non-native, invasive species.

Mitigation Measure M-BI-1b: Avoidance and Restoration.

Staging areas and other work areas shall be maintained in a weed-free condition (using herbicides, manual control, or other methods) to prevent the spread of non-native invasive plants on equipment and vehicles. Equipment and vehicles shall be washed or otherwise decontaminated before they are moved into construction sites from other locations to prevent the introduction of invasive species or pathogens.

Where it is not possible to avoid temporary loss of riparian habitat in construction areas, the SFPUC shall fully restore the functions and services of these habitats onsite, which will include revegetation of all graded surfaces with locally native plant species, and revegetation of channel banks disturbed by construction. Disturbed streambeds shall also be restored. Site restoration shall be undertaken in accordance with a detailed restoration plan or plans prepared by a qualified restoration ecologist and shall be consistent with all required permits, and all planting materials shall be pathogen-free. The final habitat restoration plan or plans shall provide, at a minimum:

Aquatic Habitat Restoration Goals and Objectives. Fully restore all temporary impacts on wetland streams and riparian habitat within three years of the completion of construction.

Restoration Work Plan. The final habitat restoration plan(s) shall include detailed written specifications and work descriptions for the restoration projects, including but not limited to: the geographic boundaries of the projects; construction methods; timing and sequence; methods for establishing the desired plant communities; plans to control invasive plant species; and erosion control measures.

Success Criteria. The final habitat restoration plan(s) shall include ecologically based criteria that will be used to determine whether the restoration projects are achieving their objectives (i.e., full restoration within five years). The success criteria shall be based on attributes that are objective and verifiable, such as percent survival of plantings or percent cover achieved by planted materials.

Monitoring Plan. The final habitat restoration plan(s) shall include a description of parameters to be monitored to determine whether the restoration projects are on track to meet performance standards and whether adaptive management is needed. A schedule for monitoring and reporting on monitoring results must be included.

Mitigation Measure M-BI-1c: Wetlands Creation and Enhancement for Construction and Operational Impacts.

The SFPUC shall compensate for unavoidable impacts on wetland habitats in accordance with detailed mitigation and monitoring plans[15] (MMP). The MMP for each mitigation site shall be prepared by a qualified biologist and shall be consistent with all required permits. The final MMP shall fully compensate for direct and indirect impacts on wetlands and for the temporal, long-term, and permanent losses of wetland, functions, and services and shall include the following: a description of the resource types and amounts that will be provided; the methods of compensation; and the manner in which the resource functions and services will address the related project impacts.

The strategy for implementing the plan may include, but is not limited to, habitat creation, enhancement, restoration, or improvement of the sites described in **Table 5.13-7**, below. The locations of these potential mitigation projects are shown in **Figure 5.13-4**.

The final MMP(s) shall provide, at a minimum:

> *Compensation Goals and Objectives.* Fully compensate to achieve no net loss of habitat functions and services, as determined in consultation with natural resource permitting agencies, for construction impacts on 1.03 acres of wetland temporary impact, 0.45 acres of wetland permanent impact, 0.06 acres of permanent loss of a non-jurisdictional artificial pond,[16] and 136 linear feet of temporary and 113 linear feet of permanent riparian habitat within five years of the initiation of construction.
>
> Fully compensate to achieve no net loss of habitat functions and services, as determined in consultation with natural resource permitting agencies, for operational impacts on 13.5 acres of wetland permanent impact, including 7.7 acres (1,357 linear feet) of riparian habitat by restoring and establishing wetlands and riparian habitat on or in the vicinity of the Peninsula watershed lands. The SFPUC shall mitigate for all potential impacts "up front," in 2010–2012, at least three to four years in advance of potential operational impacts; depending upon timing associated with the increase in reservoir storage.
>
> *Site Selection.* The final compensation plan(s) shall include a description of the factors considered during the final mitigation site selection process, including consideration of watershed needs, onsite alternatives, and the practicability of accomplishing ecologically self-sustaining habitats at the mitigation sites. All sites selected must be known to support, or be able to support, breeding CRLF and SFGS.
>
> *Site Protection Instrument.* The final compensation plan(s) shall include a description of the legal arrangements and instruments, including site ownership, used to ensure the long-term protection of the compensation sites.

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[15] The mitigation and monitoring plan (MMP) is a standard requirement for Corps permits and is separate and distinct from the Mitigation Monitoring and Reporting Program (MMRP) required under CEQA Guidelines Section 15097.

[16] The pond is used by California red-legged frog.

TABLE 5.13-7
POTENTIAL MITIGATION PROJECTS, LOWER CRYSTAL SPRINGS DAM IMPROVEMENTS PROJECT

Site Code*	Name and Location	Type of Mitigation Available for LCSDI Project	Current Status of Site	Project Components
MS-1	**Skyline Boulevard** Northern portion of San Andreas Reservoir in Peninsula watershed, west of the Skyline Boulevard and San Bruno Avenue intersection.	• wetland habitat • scrub habitat • pond habitat	Contains non-native pine and eucalyptus trees and non-native velvet grass and other non-native grasslands surrounded by native scrub habitat. A small seasonal wetland exists in the southern portion of the site where a paved fire road partially dams a small drainage. Site has been degraded by historical land uses and the presence of invasive non-native species.	• Remove one acre of non-native eucalyptus and plant with scrub vegetation. • Remove pine trees and other non-native vegetation and replace with plant scrub and seasonal wetland vegetation. • Within the seasonal wetlands area, small ponds will be excavated. • Construct new access roads.
MS-2	**San Andreas Reservoir** Northwest end of San Andreas Reservoir in Peninsula watershed.	• grasslands • riparian habitat • scrub habitat • wetland habitat	Site is dominated by scrub and non-native grassland habitats which are abundant in the surrounding area.	• Remove existing non-native grassland and scrub vegetation. • Excavate and plant wetland vegetation in wetland creation area. • Relocate portions of existing fire road off of Skyline Boulevard. • Install a concrete mat at a dip in the fire road for erosion control.
MS-3	**Upper San Mateo Creek** Northwest portion of the Peninsula watershed approximately two miles northwest of Lower Crystal Springs Reservoir along Trousdale Boulevard.	• wetland habitat • grasslands	Contains stands of non-native pine trees surrounded by scrub habitat and non-native grasslands. Past development has degraded the site and facilitated the invasion of the non-native pines.	• Remove non-native pine trees. Where pine trees are removed near existing seeps (southern portion of the site), ground disturbance would be limited to use of hand tools and tree stumps would not be removed. • For wetland creation areas, excavate and grade to create wetland basins and swales. • Construct inlet weirs and outlet structures in wetland creation areas. • Remove one existing culvert, rehabilitate second existing culvert that conveys water to San Mateo Creek. • Utilize spoils from grading to construct berm on western side of wetland area along existing road. • Plant native wetland vegetation in wetland area and native grassland species in upland areas; seed graded areas with an erosion-control mix.

TABLE 5.13-7 (Continued)
POTENTIAL MITIGATION PROJECTS, LOWER CRYSTAL SPRINGS DAM IMPROVEMENTS PROJECT

Site Code*	Name and Location	Type of Mitigation Available for LCSDI Project	Current Status of Site	Project Components
MS-4	**Skyline Quarry** North of Highway 92 in the western portion of the Peninsula watershed, and adjacent to the Fifield-Cahill Ridge Trail trailhead.	• riparian habitat • scrub habitat • wetland habitat	Contains trailhead, parking lot, restroom facilities, an unnamed intermittent stream channel, its active floodplains, and portions of adjacent upland landforms within the footprint of a former quarry. Past mining activities and invasion of non-native pampas grass on the site have degraded seasonal wetland and riparian habitat.	• Remove non-native pampas grass using mechanical and manual methods and herbicides. • Excavate mine tailings and plant with native wetland scrub vegetation. • Replace existing culvert located southwest of riparian enhancement area and replace culvert at a higher elevation. • Enhance riparian through grading and planting of riparian vegetation. • Reduce size of existing parking lot and relocate trailhead and restroom facilities.
MS-5	**Adobe Gulch Creek South** Southwestern portion of the Peninsula watershed.	• woodlands • wetland habitat • riparian habitat	Contains 3 acres of non-native eucalyptus trees adjacent to Adobe Gulch Creek and some riparian vegetation.	• Remove vegetation, excavate and grade a shallow depression, and plant native wetland vegetation in wetland creation area. • Install outlet channel to drain proposed wetland into Adobe Gulch Creek. • Stabilize Adobe Gulch Creek stream bank using bioengineering methods and planting native riparian trees and shrubs. • In oak woodland creation and enhancement area, remove up to 3 acres of selected eucalyptus trees. Grade and hydroseed tree removal area. • Plant oak trees and install temporary browse protection fencing.
MS-6	**Boat Ramp North** Directly upslope of the existing access road to a SFPUC boat launch west of Skyline Boulevard in the eastern portion of the Peninsula watershed next to Lower Crystal Springs Reservoir, about ½ mile north of Highway 92.	• wetland habitat	Contains a seasonal wetland formed by the impoundment of runoff by the roadway embankment.	• Excavate grasslands and remove non-native vegetation near existing seasonal wetlands. • Raise access road to improve drainage and replace existing culvert with a larger culvert to provide for wildlife passage. • Plant native wetland vegetation.

TABLE 5.13-7 (Continued)
POTENTIAL MITIGATION PROJECTS, LOWER CRYSTAL SPRINGS DAM IMPROVEMENTS PROJECT

Site Code*	Name and Location	Type of Mitigation Available for LCSDI Project	Current Status of Site	Project Components
MS-7	**Adobe Gulch** Near Highway 92 in the southwestern portion of the Peninsula watershed, west side of Upper Crystal Springs Reservoir	• oak woodland • wetland habitat	Largely consists of scrub habitat, coyote brush, poison oak, and small trees.	• Remove poison oak and coyote brush using mechanical means, goat grazing, manual removal, and/or herbicides. • Remove non-native cypress trees and plant oak trees within tree removal area. • Install temporary browse protection, irrigation pipeline and water storage tank for new oak trees. • Remove or modify existing access roads and construct a new permanent access road. • For wetland creation area, remove vegetation, excavate shallow depressions, plant native wetland vegetation, and replace abandoned road with ephemeral and intermittent drainage.
MS-8	**Boat Ramp South** Adjacent to Skyline Boulevard in the eastern portion of the Peninsula watershed next to Lower Crystal Springs Reservoir, about ¼ mile north of Highway 92.	• woodlands • wetland habitat • riparian habitat • scrub habitat • grasslands	Contains non-native pine trees, grasslands, and shrubs.	• Remove non-native pine trees. • Plant fountain thistle and native grassland species. • Manage fountain thistle enhancement and grassland areas through tree and brush control, active seeding, or out-planting of fountain thistle and butterfly host species.
MS-9	**Half Moon Bay / Pilarcitos** City of Half Moon Bay, adjacent to and south of Highway 92, within the historic floodplain of Pilarcitos Creek	• wetlands/pond • riparian habitat	Currently used as a corporation yard for Half Moon Bay Public Works. The site contains agricultural plots covered in black plastic tarp that are surrounded by irrigation ditches and gravel roads, which are all remnants of the former ornamental plant nursery at the site. The site also contains buildings and structures that appear to be older than 50 years—the minimum age threshold for potential eligibility for the National Register of Historic Places.	• Remove existing structures, concrete pad, and paved and gravel roadways. • Remove non-native vegetation. • Excavate pond area to capture runoff, and regrade site. • Install temporary irrigation. • Plant riparian plants.

*See Figure 5.13-4 for the location of sites.

Baseline Information. The final compensation plan(s) shall include descriptions of the ecological characteristics of the impact sites and their associated proposed compensation sites. This shall include descriptions of historical and existing plant communities, historical and existing hydrology, soil conditions, a delineation of waters of the state and U.S., a map showing the locations of the impact, and mitigation sites, and other site characteristics appropriate to the types of resources proposed as compensation (e.g., characterization of suitability for CRLF and SFGS).

Compensation Plan. The final MMPs shall specify the compensation for all habitat types addressed in the plan(s) needed to achieve no net loss of habitat areas, functions, and services, and the rationale used to determine their sufficiency. Factors considered in determining the adequacy of the compensation shall include:

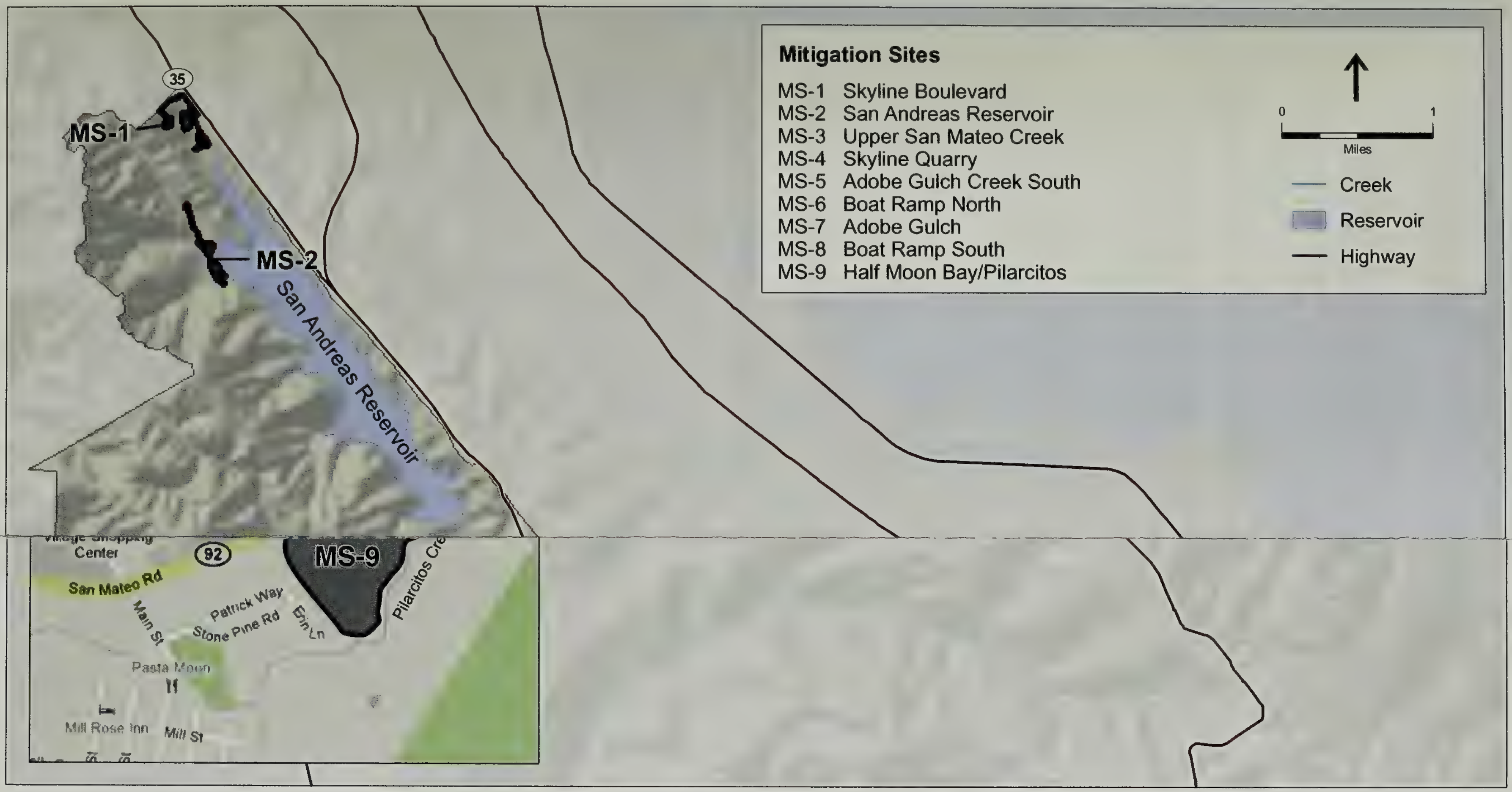
- The quality of the affected habitat compared with the potential of the compensation site
- The similarity of the compensation site to the affected habitat in terms of site potential (soil, topographic, and hydrologic characteristics) and proposed vegetation composition and structure
- The timing of compensation site development in relation to the anticipated loss of existing habitat
- The connectivity of proposed compensation habitat with existing, occupied habitat
- The likelihood of success of the proposed enhancement actions
- The differences between the habitat functions and services lost and those expected to be provided by the compensation
- Temporal losses of resource functions and services
- The difficulty of restoring or establishing the desired habitat types and functions
- The distance between the affected habitat and compensation sites

Mitigation Work Plan. The final MMP(s) shall include detailed written specifications and work descriptions for the compensation projects, including but not limited to: the geographic boundaries of the projects; construction methods; timing and sequence; sources of water, including connections to existing waters and uplands; soil properties (e.g., particle size, organic content, etc.); methods for establishing the desired plant communities; plans to control invasive plant and animal species; dewatering plans, as applicable; proposed grading plans, including the elevation and slope of the substrate; soil management; and erosion control measures.

Maintenance Plan. The final MMP(s) shall include a description and schedule of maintenance requirements to ensure the continued viability of the habitats once initial construction is completed, and a program to regularly reduce non-native predatory amphibians and fish.

Success Criteria. The final MMP(s) shall include ecologically based criteria for use in determining whether the compensation projects are achieving their objectives. The success criteria shall be based on attributes that are objective and verifiable.

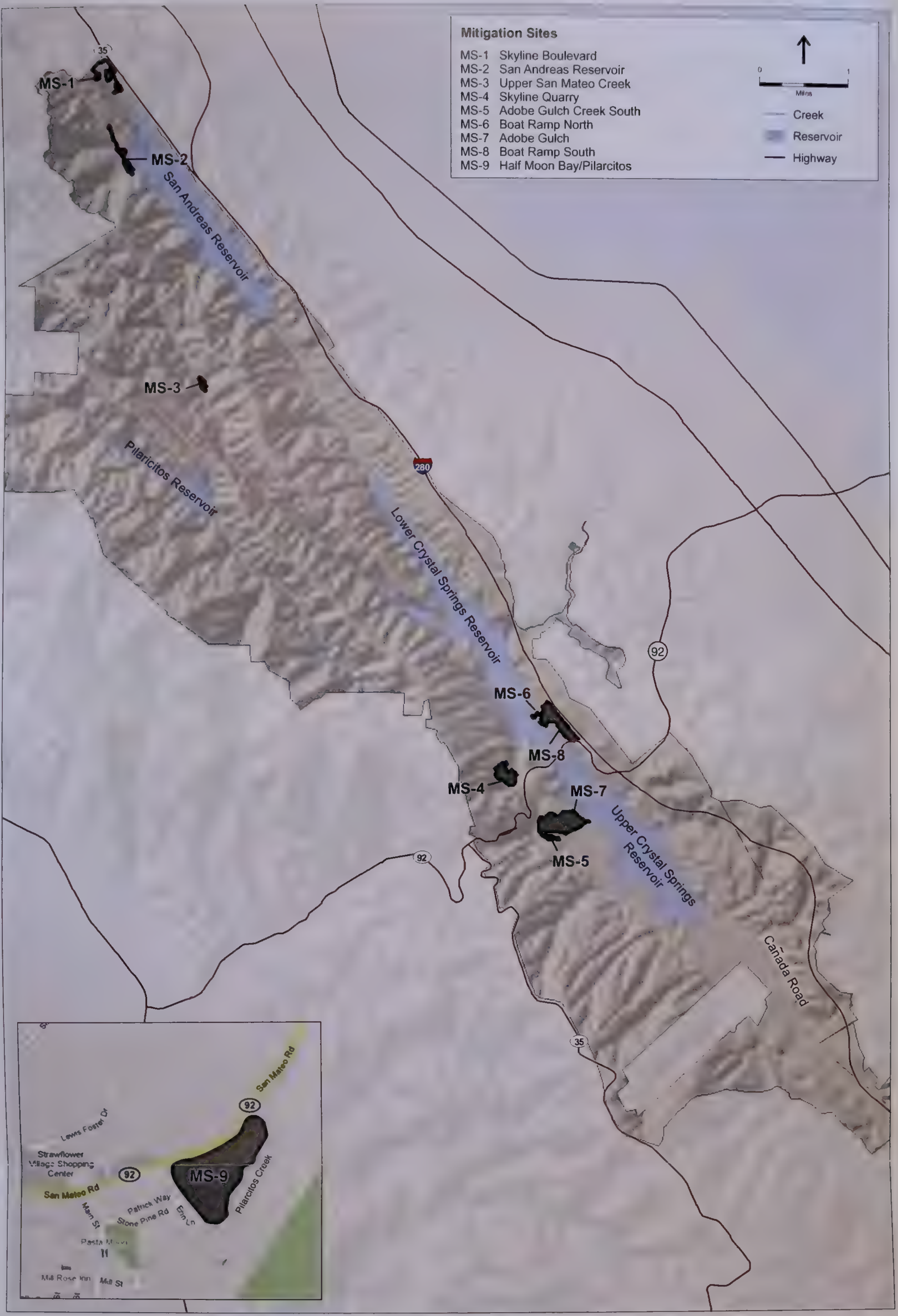
Monitoring Plan. The final MMP(s) shall include a description of parameters to be monitored to determine whether the compensation projects are on track to meet performance standards.



SOURCE: ESA + Orion, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.13-4
Mitigation Sites



SOURCE: ESA + Orion, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.13-4
Mitigation Sites

A schedule for monitoring and reporting on monitoring results must be included. Monitoring and reporting shall continue for five years, or the length of time required by regulatory agencies.

Long-Term Management Plan. The final MMP(s) shall describe how the compensation sites will be managed after the performance standards have been achieved to ensure the long-term sustainability of the resources, including long-term financing mechanisms and the party responsible for long-term management.

Mitigation Measure M-BI-2: Individual Tree Replacement.

For each removed tree protected by the San Mateo County Significant Tree Ordinance (defined as any live woody plant rising above the ground with a single stem or trunk that has a 4-inch dbh or greater[17], the SFPUC shall plant a long, 1-gallon pot replacement tree of the same species. If replanting trees on the same site is not feasible, the SFPUC shall designate a suitable planting site on the Peninsula watershed. Planting shall occur within one year after construction is completed. See Mitigation Measure M-BI-7b, below, for a description of performance criteria.

Mitigation Measure M-BI-3a: Frog Relocation.

During the breeding season and preceding construction on the dam surface, all frog eggs and tadpoles shall be moved to a suitable refugium on Peninsula watershed lands, at a location deemed acceptable by the USFWS and the CDFG. Work shall be conducted by biologists with valid agency authorization.

Mitigation Measure M-BI-3b: Exclusion Fence.

The SFPUC shall ensure that the LCSD work areas (i.e., areas with ground disturbance or off-pavement vehicle activity) are fenced along a perimeter that encompasses the entirety of the work areas at and below the LCSD. The fence will be made of 4- by 8-foot plywood panels joined lengthwise, or an equivalent fence type as approved by the regulatory agencies, with escape funnels to allow egress from but not access to the site by SFGS and CRLF. The following actions shall be taken to avoid mortality during the initial site clearance and fence installation: use of hand held tools to clear low-lying vegetation and hand held power tools (e.g., chain saw) to clear trees prior to use of ground disturbing equipment (e.g., small bobcat), and trapping and relocating frogs out of the excavation area. Work shall be conducted by biologists with valid agency authorization, and any red-legged frogs shall be relocated outside the fenced area.

Mitigation Measure M-BI-3c: Biological Monitoring.

During project construction, an environmental inspector (EI) who is familiar with the identification and life history of CRLF, SFGS, and other potentially present special-status species, and with the appropriate agency authorization, shall be designated to periodically inspect onsite compliance with all mitigation measures, consistent with the worker awareness program (Mitigation Measure M-B-1a).

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[17] The SMC tree ordinance applies to trees 12 inches dbh pr greater; thus this EIR replacement standard is more conservative.

The EI shall perform a daily survey of the entire project area during initial ground-breaking activities and during the rainy season. During these surveys, the EI shall inspect the exclusion fencing for individuals trapped within the fence and determine the need for fence repair. After ground-breaking activities and during the non-rainy season, the inspector shall continue to perform daily fence surveys and compliance reviews at the project site. The EI shall operate under the direction of a project environmental compliance manager and shall have one or more specialty environmental monitors on call, with a valid permit to handle listed species. The specialty monitor shall direct all personnel in regards to interactions with sensitive species, perform authorized species relocations, and supervise all reporting on such species.

Mitigation Measure M-BI-3d: Preconstruction Surveys and Avoidance of Nesting Birds.

If construction activities (i.e., ground clearing and grading, including removal of trees or shrubs) are scheduled to occur during the nonbreeding season (September 1 through January 31), no mitigation is required.

If construction activities are scheduled to occur during the breeding season (February 1 through August 31), the SFPUC shall implement the following measures to avoid potential adverse effects on nesting raptors and other special-status birds:

- A qualified wildlife biologist shall conduct preconstruction surveys for active nests within 300 feet (for raptors) or 100 feet (for migratory birds) of ground-disturbing activities, where access is available. These surveys will include ground-nesting species in grasslands (e.g., burrowing owl).

- If active nests (eggs/chicks present) are found during preconstruction surveys, the SFPUC shall establish a no-disturbance buffer (acceptable in size to the CDFG) around active raptor nests and nests of other special-status birds during the breeding season, or until it is determined that all young have fledged. Typical buffers are 300 feet for raptors and 100 feet for other nesting birds. The size of these buffer zones and the types of ground-disturbing activities restricted in these areas may be further modified during coordination with the CDFG and shall be based on existing noise and human disturbance levels at the project area. Nests initiated during construction are presumed to be unaffected, and no buffer would be necessary. If preconstruction surveys indicate that nests are inactive or potential habitat is unoccupied during the construction period, nesting substrate (i.e., trees, shrubs, and buildings) in this area can be removed, and no further mitigation is required.

- If there is a break of at least five days in construction activities during the nesting season, an additional nesting bird survey shall be conducted to ensure that no birds have occupied nests during the pause in construction activity.

Mitigation Measure M-BI-3e: Avoidance of Roosting Bats.

For trees to be removed, a qualified biologist shall identify those that show evidence of roosting use by any of the six special-status bat species that might occur in the project area. The SFPUC shall remove identified maternity roost trees only after the young are volant (capable of flying), normally between August and mid-October. If a maternity roost is located within the construction area, treatment of known maternity roosts, including active relocation, may be considered in consultation with the CDFG.

If a non-maternity bat roost is detected, a qualified biologist shall remove it using methods such as: (1) opening the roost area to allow airflow through the cavity, making the roost unsuitable for bats prior to the start of tree removal, or (2) excluding the bats using one-way doors, funnels, or flaps.

Mitigation Measure M-BI-3f: Preconstruction Clearance Surveys for San Francisco Dusky-Footed Woodrat.

The SFPUC shall ensure that a qualified biologist conducts a survey for woodrat middens (i.e., nests) within all limits of construction prior to the initiation of clearing or grading in any given location. This survey should be conducted early enough to address any middens requiring removal prior to site clearing. If no middens are found within such areas, no further action is required. If middens are found and can be avoided, the biologist shall direct the contractor in placing orange barrier fencing or flagging between the proposed construction clearing and the midden, giving as much room as possible to avoid indirect disturbance to the midden, but no less than a minimum distance of 2 feet from and along the construction side of the middens to protect them from construction activities.

If the minimum fencing distance cannot be achieved and the middens cannot be protected and/or avoided, a qualified biologist shall disassemble middens, or, if adjacent habitat is not suitable, trap and relocate woodrats out of the construction area (using live traps) prior to the start of construction. In addition, the biologists shall attempt to relocate the disassembled midden to the same area where the woodrats are released. If young woodrats are present during disassembling, the biologists shall discontinue disassembling and return at least 24 hours later to allow time for the young to be relocated.

Mitigation Measure M-BI-3g: General Avoidance Measures.

The SFPUC and its contractors shall minimize construction impacts on other wildlife as follows:

- During project activities, all trash that could attract predators to potentially present special-status species shall be properly contained and removed from the worksite daily. Following construction, the construction contractor shall remove all trash and construction debris from work areas. In addition, vegetation waste management shall be practiced to help ensure that trees, shrubs, debris, soils, or construction materials are not inadvertently placed below the ordinary high-water mark of any streams or riparian areas.

- The number of access routes, the use of staging areas, and the total area of the activity shall be limited to the minimum necessary to complete construction and, in coordination with the qualified biologist, shall be delineated on the project drawings before work begins. The routes and boundaries shall be outside riparian and wetland areas to the greatest extent possible.

- The construction contractor shall confine all equipment and construction operations to the work areas, generally defined by exclusion fencing.

- Project-related vehicles shall observe a 15-mph speed limit on unpaved roads through the project areas.
- No pets or firearms shall be allowed in the project areas.
- If worksites require dewatering, the intakes shall be screened with a maximum mesh size of 5 millimeters.
- All erosion control materials shall be free of weeds and plastic monofilament and nylon wire (erosion control blankets and mats backed with plastic and nylon netting are known to entrap and injure amphibians and snakes).
- Project personnel shall immediately report any harm, injury, or mortality of a special-status species during construction, including entrapment, to the construction foreman or biological monitor. The construction foreman or monitor shall immediately notify the SFPUC, which will provide verbal notification to the USFWS and/or to the local CDFG warden or biologist (as applicable) within one working day of the incident. The SFPUC shall follow up with written notification to the USFWS and/or CDFG (as applicable) within five working days of the incident. The biological monitor shall submit all observations of special-status species to the CNDDB.

Mitigation Measure M-BI-7a: Serpentine Grasslands Enhancements.

The SFPUC shall identify a site with at least 10 acres of degraded or potential serpentine grassland (e.g., the Boat Ramp South site described in Table 5.13-7 above), sufficient to fully compensate to achieve no net loss of habitat functions and services as determined in consultation with natural resources permitting agencies for impacts on 8.3 acres of serpentine bunchgrass. The site, or another site deemed appropriate by a qualified biologist, shall be restored by removing trees, brush, and litter; using herbicides to remove invasive weeds; and planting native serpentine grassland species. Site preparation and planting shall be completed prior to implementation of the proposed operations (i.e., before the SFPUC begins raising the maximum normal reservoir elevations from 283.8 to 287.8 feet). As described in Mitigation Measure M-BI-1c, restoration shall be carried out in accordance with an MMP that specifies goals and objectives; the rationale for the site selected and intended actions; a detailed work plan; a maintenance plan; success criteria, such as percent cover of native perennial bunchgrasses or native bunchgrass species richness; a monitoring plan; and a long-term management plan. This mitigation measure shall be carried out in conjunction with Mitigation Measure M-BI-8a, Listed and Nonlisted Special-status Plants, described below.

Mitigation Measure M-BI-7b: Oak Woodland Mitigation Program.

To ensure there is no net loss of oak woodlands due to normal reservoir operation and exceedances, the SFPUC shall replant, preserve, or enhance oak woodlands. Given the complexity of the actions proposed, and the different time periods required for different forms of mitigation, the SFPUC shall implement a combination of compensation methods, described below as Options A, B, and C. Compensation for project impacts on oaks will be achieved through the replanting of approximately 20 acres of oak woodland (Option A, below) and preservation and/or conservation of approximately 20 acres of existing, at-risk oak woodland

(Options B or C, below). The final plan(s) for each option shall specify the compensation option(s) chosen to achieve no net loss of habitat areas, functions, and services, and the rationale used to determine this compensation. In developing these plan(s), the SFPUC shall consider the following factors to determine the appropriate extent of which mitigation options to implement:

- The likelihood of success
- Differences between the habitat functions and services lost and those expected to be provided by the mitigation
- Temporal losses of resource functions and services
- The difficulty of restoring or establishing the desired habitat types and functions
- The distances between the affected habitat and compensation sites

Under the terms of the project description (Chapter 3, Section 3.7), reservoir levels shall not exceed 287.8 feet until at least three years after completion of the LCSDI project. The SFPUC shall identify its preferred mitigation option(s) for the final oak woodland mitigation program within those three years, although mitigation may be initiated sooner in order to minimize temporal losses. The three options are as follows:

Option A. Replanting Program. The SFPUC shall offset oak woodland impacts by creating new oak woodland habitat through an oak woodland replanting program. The SFPUC shall identify oak woodland replanting sites according to the criteria set forth in section A.1 below; sites are subject to the monitoring and performance criteria described in section A.2. Due to the large acreage of potentially affected oak woodlands and because of the time necessary to establish successfully replanted oak woodlands, Option A shall account for no more than 50 percent of the oak woodland mitigation.

A.1 Planting sites shall be selected based on the current lack of coast live oaks and demonstrable suitability of a site to support coast live oak woodland, such as soil type and depth, slope, and aspect. A typical suitable site would have historical evidence of past coast live oak woodland and would be strongly dominated by non-native species. In such cases, existing vegetation would be more or less fully removed before planting oaks.

A.2 For all oak/oak woodland replanting efforts, a Site Replanting Plan shall be developed by a qualified biologist prior to implementation. This plan shall discuss the specifics of implementing the replanting and long-term monitoring of the oak woodland mitigation sites. The site replanting plan shall include the following components:

Purpose and goals. The purpose of the Site Replanting Plan is to provide a detailed set of specifications for correct implementation of oak woodland restoration. Site Replanting Plan goals include: restoring oak woodland habitat within the same watershed as the LCSDI project in order to provide local wildlife habitat, maintain aesthetic value, and preserve open space. Off-watershed planting projects will be considered if oak silviculture would be less environmentally impacting than any proposed LCSDI watershed site.

Identification of responsible parties. The SFPUC shall be responsible for ensuring that restoration and monitoring are implemented according to the plan. A restoration monitor (a qualified biologist or restoration ecologist) shall be retained by the SFPUC to oversee the replanting project and to implement the plan.

Implementation of replanting. Replanting would be implemented within 4 years of EIR certification.

Planting specifications. These include: design drawings, planting palette, local plant sources, plant spacing, irrigation, erosion control, debris removal, weed eradication, plant installation, screening for plant pathogens if seedlings are to be planted, and plant protection measures.

Success and performance criteria. The mitigation shall be deemed successful if, after 10 years, total percent cover of oak trees increases incrementally over a five-year monitoring period; and total percent cover should be a minimum of 50 percent.[18] Performance standards shall also include the minimum requirements for the legal instruments imposing preservation/conservation of replanted sites in perpetuity.

Long-term monitoring methods. This section of the plan shall include a description of the scientifically based methods to be used to quantitatively measure plant growth and establishment as they apply to the success criteria. Methods should include: line-intercept sampling to determine overall percent cover and percent cover of oak trees, a comprehensive count of all planted woody individuals and an assessment of their health, and height and canopy measurements of all oak trees. A photo-documentation protocol shall also be established whereby photos of the replanting site and reference sites are taken from the same vantage point during annual monitoring.

Maintenance, monitoring, and reporting schedule. Maintenance shall be conducted at least twice a year at the restoration site—once during the spring and once during the summer, or more frequently if deemed necessary by the restoration monitor until the success criteria are met. Maintenance shall include: non-native species removal, erosion control maintenance, and maintenance of plant protection measures. Monitoring of the restoration site shall occur once annually in the late spring (May), except during the first year after completion of planting, when it will occur both in the spring (May) and fall (August). Additionally, shortly after the completion of planting, a baseline monitoring visit shall take place, during which the restoration monitor would conduct the first round of monitoring. A report of the baseline conditions will be included in the first year monitoring report. The restoration monitor shall prepare annual reports, which will include an evaluation of the success of the project against the success criteria; the reports will be submitted to the SFPUC and the San Francisco Planning Department, Environmental Review Officer by the end of each calendar year. In the event that restored areas do not meet the success criteria, remedial actions will be taken. Remedial actions may include: replanting, additional weed maintenance, installation of additional erosion control or plant protection materials, or modifications to an irrigation system. An analysis of the site conditions and project success shall be included in each annual monitoring report, which will provide suggested remedial actions.

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[18] Oak plantations, for a number of reasons, perform less successfully than other types of silviculture. In one study comparing several planting techniques, Plumb (1996) found survival of only 37.1 percent; 60 percent was only attained after replanting. Fifty percent total cover is therefore a reasonable goal if an entire site is evenly planted.

Option B. SFPUC preservation of local oak woodlands. The SFPUC may offset oak woodland impacts by establishing oak woodland preservation and enhancement sites in the CCSF-owned Peninsula watershed. Oak woodland preservation and enhancement sites shall be identified by applying the factors set forth in section (B)(1) below; sites are subject to the monitoring and performance criteria described in section (B)(2).

B.1 *Preservation and Enhancement Sites*

Preservation Sites. The intent of the preservation site is to identify two to three stands of oak woodland on the Peninsula watershed that are largely intact but considered at risk, and to proactively and aggressively manage the stands for long-term health and reproduction. The current threats to extant stands may include, but are not limited to, Sudden Oak Death or other pathogen, lack of natural regeneration (senescence), or potential threats from human activity. Any preservation site must provide oak woodland benefits which would not be part of normal watershed management; (i.e. the selected stands would be managed in perpetuity independent of other watershed operations, and techniques reviewed and revised every five years consistent with an adaptive management program).

As part of the preservation classification, the SFPUC will apply its ongoing Sudden Oak Death management actions as an element of the oak woodland mitigation program at the designated sites. The current SFPUC activities on the Peninsula watershed have several relevant constituent elements, including:

- Treatment of mature healthy tanoak trees with Agrifos or an equivalent product shown in nursery settings to protect oak trees from Sudden Oak Death.
- Treatment of selected "heritage" (larger and older) coast live oak trees with Agrifos (or an equivalent product).
- Removal of California bay to reduce the risk of Sudden Oak Death in coast live oaks. In coastal California forests, California bay is the primary source of the Sudden Oak Death pathogen; infected coast live oaks are usually found within a few meters of an infected bay tree.
- Monitoring of control areas initially containing healthy coast live oak trees.

In addition to these ongoing actions to manage and control Sudden Oak Death, preservation sites could also be managed to maximize the productivity and volume of oaks and diversity of the woodland as a community type. Such actions would be consistent with accepted silvicultural methods, and could include the following:

- Pruning and thinning to maintain a diversity of ages and sizes of coast live oaks
- Repair of erosional areas, roads, and culverts to preserve ecosystem quality
- Control feral animals like pigs, which are detrimental to ecosystem quality.

Enhancement Sites. Option A.1 would apply to sites where oaks are restored exclusively through replanting. However, in some areas on the Peninsula watershed, rapidly growing Monterey pine appear to overtop grassland and shrubland with extant young coast live oak, and without this competition, site conditions (in the absence of fire) appear to favor the eventual development of coast live oak woodland. Sites such as these would be *enhanced.* Specifically, Monterey pine would be removed, with some dead trees left as snags.

B.2 *Similar to Option A, a site plan (preservation or enhancement) shall be prepared for each site under Option B*.

Prior to implementation, the SFPUC shall develop an Oak Woodland Preservation Plan in consultation with a qualified specialist for identified preservation and enhancement sites. The plan shall involve testing, evaluating, and implementing multiple concurrent strategies for Sudden Oak Death control and management strategies to maximize the chance of retaining coast live oak woodland resources. Components of the plan shall include:

- A methodology for site-specific risk assessment for Sudden Oak Death or other factors that would be likely to influence success at a particular site (species composition, topography, hydrology, pathogen presence, etc.)
- Strategic selection of target areas for improving regeneration, mature oak retention, and manipulation of species composition or other habitat elements
- A multi-pronged Sudden Oak Death prevention effort that could include Agrifos (or an equivalent product), bay removal, mulching, and other strategies
- Identification of trees with evidence of resistance to Sudden Oak Death, and the use of these trees as a source of locally derived planting stock while retaining maximum genetic diversity
- Ongoing monitoring and adaptive management to incorporate new knowledge as it becomes available

An Oak Woodland Enhancement Plan shall be developed for any LCSDI enhancement site, similar in organization and content to the Site Replanting Plan described under A.2, above, i.e., Purpose and goals of the project; Identification of responsible parties; Treatment specifications; Success criteria or performance standards; Long term monitoring methods; and Maintenance, monitoring, and reporting schedule.

Option C. Contribution to Oak Conservation Funds or Actions on Other Open Space Lands. If this option is selected, the SFPUC shall offset oak woodland impacts by contributing mitigation funds to other land trustee agencies (e.g., Peninsula Open Space Trust, Midpeninsula Regional Open Space District) or to a private landowner for use in purchasing oak woodlands threatened by development or for preservation, enhancement, or planting efforts. These woodlands would be outside the CCSF-owned watershed but within Santa Clara, Alameda, or San Mateo Counties. Payment for conservation through an oak mitigation fund or as a financial grant to the landowner for a conservation easement would offset the loss of oak woodlands affected by the LCSDI project. The price per acre for contributions under Option C shall be based on the primary costs of the action contemplated by the landowner, plus the costs of any follow-up actions (e.g., monitoring) for a period of five years. If purchased from a private landholder, the SFPUC shall ensure all legal instruments are in place so that the oak woodlands are preserved in perpetuity.

Mitigation Measure M-BI-8a: Listed and Nonlisted Special-status Plants.

This mitigation measure shall be carried out in conjunction with Mitigation Measure M-BI-7a. Mitigation for impacts on 0.30 acre of fountain thistle and 0.002 acre of Marin western flax shall be carried out at a specific site with the potential to support these species, as determined by a qualified biologist. An example would be the Boat Ramp South site described above in Table 5.13-7. Habitat would be replaced to achieve no net loss of habitat functions and services for the species, as determined in consultation with natural resource permitting agencies. It is expected that serpentine spring habitat will form naturally at higher elevations than at present due to the rise in groundwater resulting from higher reservoir operating elevations. Increased flows in existing zones of serpentine seeps may also occur naturally if the water demands by non-native trees are removed. Removal of non-native trees, together with the predicted change in hydrology, will create suitable mitigation habitat. Increased habitat for Marin western flax is expected to form where non-native woodland and accumulated litter and duff on serpentine soil are removed and grassland restored to the site. Enhanced and restored occupied habitat shall be equal in extent to the predicted loss of habitat below the 291.8-foot elevation.

For impacts on all other special-status plants—western leatherwood (0.09 acre), San Francisco collinsia (0.01 acre), and Franciscan onion (0.02 acre)—that cannot be avoided, the SFPUC shall fully compensate to achieve no net loss of habitat functions and services. To the extent feasible, habitat enhancement shall take place at sites already planned for other mitigation for this project; if habitat is not suitable at those sites, habitat enhancement would be carried out at appropriate nearby sites through strategies such as transplantation, relocation or seed harvest.

Mitigation for impacts on Crystal Springs lessingia (2.59 acres) would be similar to that for Marin western flax; that is, removal of non-native trees and grassland management to reduce competition from non-native herbs and grasses. This measure would be carried out on sites that are known to contain serpentine-derived soils (i.e., Obispo clay or Fagan loam), are dominated by non-native grasses at present, and do not currently support Crystal Springs lessingia but appear to have site potential to support this species. Management of the grassland for serpentine bunchgrass species would also improve habitat for Crystal Springs lessingia, such as removing trees, litter, and duff and reducing competition from non-native grasses and herbs. This management strategy is also expected to provide additional habitat for Franciscan onion.

All habitat improvements shall be carried out prior to the implementation of the increased maximum normal reservoir operating elevation. For the first five years following the reservoir elevation reaching a sustained operating maximum of 287.8 feet, the SFPUC shall carry out annual surveys to determine the effectiveness of the habitat improvements.

Mitigation Measure M-BI-8b: Scrub and Grassland Enhancement for Upland Refugia.

A total of 34.8 acres of upland refugia for SFGS (consisting of 13.8 acres of scrub and 21.0 acres of grasslands) and potential WPT nesting habitat will be lost due to the increase in maximum normal operating elevation from 283.8 to 287.8 feet. The SFPUC shall identify a site with at least 35 acres of degraded scrub and grassland habitat and manage the site(s) by removing trees and invasive weeds to enhance scrub and grassland habitat for upland refugia for SFGS and potential WPT nesting habitat.

Mitigation Measure M-BI-8c: Predator (Bullfrog) Control.

Under Impact BI-8, this EIR concluded that inundation is unlikely to cause direct mortality of SFGS; however, snakes that exit a winter retreat may be exposed to an increased risk of predation. To mitigate the effects of a possible net decline in SFGS productivity, the SFPUC shall institute a predator (predominantly bullfrog) control program once each year for ten years in areas where compensatory productivity increases could be most effectively obtained: Tracy Lake and Golf Course ponds. In addition, all sites used for mitigation (consistent with WSIP PEIR Mitigation Measure 4.16.4a) will be subject to long-term control actions for non-native species. Predator control would consist of annually draining permanent ponds and capturing and removing bullfrogs.

5.13.3.7 Impacts Associated with Implementation of Mitigation Measures

CEQA Section 15126.4 states that "if a mitigation measure would cause one or more significant effects in addition to those that would be caused by the project as proposed, the effects of the mitigation measure shall be discussed but in less detail than the significant effects of the project as proposed." This section identifies potential effects associated with the habitat creation/enhancement/restoration projects described in Mitigation Measures M-BI-1c, M-BI-7a, M-BI-7b, M-BI-8a, and M-BI-8b, above. Implementation of habitat compensation mitigation measures may include, but is not limited to, habitat creation, enhancement, restoration, or improvement of the sites listed above in Table 5.13-7. These sites are shown above on Figure 5.13-4 as well.

Table 5.13-7 identifies specific sites for purposes of describing representative, potentially feasible habitat mitigation sites. However, the SFPUC could utilize alternative sites in addition to or instead of these sites so long as the final sites meet the performance criteria in Mitigation Measures M-BI-1c, M-BI-7a, M-BI-7b, M-BI-8a, and M-BI-8b, thereby ensuring mitigation of the project's potential habitat impacts to less-than-significant levels. SFPUC will identify final mitigation sites in consultation with Responsible Agencies, such as Corps, RWQCB, CDFG, and USFWS, following approval of the LCSDI project.

Secondary environmental impacts associated with typical habitat mitigation sites would be reduced to less-than-significant levels through implementation of the mitigation measures described in Chapter 5 and listed in Chapter 6 of this EIR; however, conditions specific to the sites listed in Table 5.13-7 raise potential impact issues that could warrant additional measures, denoted with "MS," below. The following impact analysis describes the general and site-specific mitigation measures applicable to secondary impacts of habitat mitigation sites.

Impacts of Mitigation Measures

The intent of habitat creation, preservation, or enhancement projects is to have an overall beneficial effect on biological resources by increasing the function and size of other sites that are currently degraded and, in doing so, creating habitat for special-status species. Certain construction, operation, and maintenance activities proposed at compensatory habitat sites, however, could have short-term but potentially significant impacts on biological and other resources.

For example, implementation of proposed improvements at habitat mitigation sites could result in impacts on cultural resources, sensitive noise receptors, air quality, biological resources, geology and soils, hydrology and water quality, and hazards and hazardous materials. Implementation of the following project mitigation measures would generally reduce these impacts to *less than significant*. The following EIR mitigation measures would be implemented to protect cultural resources, as appropriate for specific mitigation sites:

- Mitigation Measure M-CP-3 (Inadvertent Discovery of Archaeological Resources)
- M-CP-4 (Unanticipated Discovery of Paleontological Resources)
- M-CP-5 (Inadvertent Discovery of Human Remains)

With implementation of these measures, potential impacts on cultural resources would be avoided or reduced to less than significant.

The following EIR mitigation measures would be implemented, as appropriate for specific mitigation sites, for noise and air quality:

- Mitigation Measure M-NO-1 (Administrative Source Controls) would avoid construction-related noise impacts at nearby sensitive receptors
- Mitigation Measures M-AQ-1a (BAAQMD Dust Control Measures)
- M-AQ-1b (BAAQMD Exhaust Control Measures)
- M AQ-1c (Additional Exhaust Control Measures)

Taken together, these measures would avoid potential impacts associated with construction-related dust, exhaust, and other air quality emissions.

The following measures would be implemented, as appropriate for specific mitigation sites, to mitigate impacts on biological resources:

- Mitigation Measure M-BI-1a (Worker Training Program)
- M-BI-1b (Avoidance and Restoration)
- M-BI-2 (Individual Tree Replacement)

- M-BI-3c (Biological Monitor)
- Mitigation Measure M-BI-3d (Preconstruction Surveys and Avoidance of Nesting Birds)
- M-BI-3e (Avoidance of Roosting Bats)
- M-BI-3f (Preconstruction Surveys for San Francisco Dusky-Footed Woodrat)
- M-BI-3g (General Avoidance Measures)

Taken together, these measures would avoid or mitigate potential impacts on wetlands, aquatic resources, riparian habitat, special-status species, sensitive habitats, and trees considered "heritage trees" or "significant trees" by the County of San Mateo.

Implementation of Mitigation Measure M-HY-3 (Preparation and Implementation of a SWPPP) would avoid construction-related impacts to water quality.

Supplemental Mitigation Measures

In addition to application of the foregoing mitigation measures, the SFPUC would implement the following mitigation measures at individual sites as appropriate to further ensure site-specific impacts remain less than significant. This EIR identifies the applicability of the following supplemental mitigation measures to projects described in Table 5.13-7, but the measures could also apply to other unspecified sites as necessary to avoid significant impacts.

Mitigation Measure M-MS-CP-1: Historic Context and Archaeological Survey Report

Following the SFPUC's final determination of mitigation sites, a qualified archaeologist shall prepare an Archaeological Survey Plan (ASP) in compliance with the San Francisco Planning Department Major Environmental Analysis Division's (MEA's) archaeological guidelines for WSIP projects. In accordance with the ASP, the qualified archaeologist shall conduct a reconnaissance-level survey of mitigation sites as appropriate to determine the presence of archaeological resources (e.g., Half Moon Bay/Pilarcitos, site MS-9) prior to implementation of the project-specific mitigation measure. If a recorded archaeological site is found on or near the mitigation site, a Historic Context and Archaeological Survey Report (HCASR) shall be prepared by the qualified archaeologist in compliance with MEA's archaeological guidelines for WSIP projects. The HCASR shall be approved by MEA's Environmental Review Officer (ERO), or a designee, and shall be submitted to the Northwest Information Center.

Mitigation Measure M-MS-CP-2: Extended Archaeological Survey (EAS) (Site MS-9)

If a recorded archaeological site is found on or near the mitigation site, and a HCASR has been prepared, an Extended Archaeological Survey (EAS) shall be prepared and implemented by a qualified archaeologist to define the boundaries of any recorded archaeological site (e.g., CA-SMA-81 located at Half Moon Bay/Pilarcitos, site MS-9). The EAS shall be prepared in compliance with MEA's archaeological guidelines for WSIP projects. The results of the EAS shall be incorporated into the HCASR prepared under Mitigation Measure M-MS-CP-1.

Mitigation Measure M-MS-CP-3: Archaeological Evaluation Plan and Evaluation Report

Following the SFPUC's final determination of mitigation sites, a qualified archaeologist shall prepare an Archaeological Evaluation Plan (AEP) consistent with MEA's archaeological guidelines for WSIP projects (e.g., potentially applicable to Skyline Quarry, site MS-4, and Adobe Gulch Creek South, site MS-5). The AEP shall create a program to determine the potential for the resources to meet the criteria of the National Register of Historic Places and the California Register of Historic Resources, and the findings of the evaluation shall be presented in an Archaeological Evaluation and Effects Report (AEER) consistent with MEA's archaeological guidelines for WSIP projects.

If, based on the conclusions of the AEER, the ERO determines the site(s) is eligible for the National Register of Historic Places and the California Register of Historical Resources, the SFPUC shall determine whether the site(s) could be avoided through project redesign. If the project cannot avoid the site(s), an Archaeological Research Design and Treatment Plan (ARDTP) shall be prepared by the archaeologist and submitted to the ERO. The ARDTP will be prepared consistent with MEA's archaeological guidelines for WSIP projects. Once approved by the ERO, a data-recovery investigation and/or other treatment shall be conducted by the archaeologist and the findings shall be reported to the ERO in an Archaeological Data Recovery Report (ADRR).

Mitigation Measure M-MS-CP-4: Avoidance of Historical Resources

If a mitigation site contains structures older than 50 years, a Secretary of the Interior-qualified architectural historian shall record and evaluate the structures (e.g., structures at Half Moon Bay/Pilarcitos, site MS-9). A Historic Resources Survey and Evaluation Report shall be completed and submitted to MEA. If a structure at a mitigation site is potentially eligible for listing in the National Register of Historic Places and the California Register of Historical Resources, the SFPUC shall revise its construction plans to avoid physical impacts to the structure by altering the site perimeter to exclude any such structure.

Mitigation Measure M-MS-AQ-1: Prescribed Burn Limits

For mitigation projects that involve the use of prescribed burns for either construction or operations (e.g., Adobe Gulch, site MS-7) the SFPUC shall ensure that prescribed burns are limited to approximately three acres per day or an appropriate acreage to ensure that emissions rates do not exceed the Bay Area Air Quality Management District significance thresholds for criteria pollutants.

Mitigation Measure M-MS-GE-1: Access Road Improvements and Maintenance

To the extent feasible, dirt access roads for mitigation sites shall be located away from steep gradients, landslide-prone areas, and areas with poor drainage. However, for mitigation projects involving construction of access roads on steeply to moderately sloped terrain (e.g., Adobe Gulch, site MS-7), the SFPUC shall incorporate an access road improvements and maintenance plan into the project design and contractor specifications for the construction of new, permanent dirt access roads. The project design shall specify road design guidelines and maintenance requirements that would be implemented to minimize concentrated runoff and associated development of erosional channels, rills, or gullies. The project shall include a regular inspection schedule and maintenance requirements, including replacement and repairs to sediment and runoff control best management practices (BMPs), and revegetation and stabilization of eroded road cuts or fill slopes.

Mitigation Measure M-MS-GE-2: Geologic Investigation and Stability Analysis, Geologic Investigation and Stability Analysis

For mitigation projects with the potential for slope stability hazards and exposure to and possible damage from landslides or liquefaction (e.g., Skyline Boulevard, Upper San Mateo Creek, and Skyline Quarry, sites MS- 1, 3, and 5, respectively), the SFPUC shall retain a qualified geotechnical engineer to conduct a site-specific geologic investigation and a slope stability analysis to identify and mitigate potential hazards. The analysis shall delineate areas of existing and potential mass movement as well as identify soils prone to liquefaction, lateral spreading, or subsidence. The geotechnical engineer shall recommend a suitable analysis, conduct the investigation, and prepare a site-specific geologic/geotechnical assessment report. These evaluations shall be analyzed in terms of the proposed changes to the site. As appropriate to each project, the SFPUC shall incorporate the recommendations identified in the site-specific geotechnical report, including appropriate construction measures and design features, and, if needed, slope stabilization measures, into the project design to minimize the potential for unstable geologic conditions during construction and operation of the habitat improvement activities. The geotechnical engineer shall provide necessary inspection and reporting throughout the project construction. The engineering remedies developed in these recommendations are not expected to incur secondary impacts on the environment, because geotechnical mitigation typically relies on accepted soil foundation stabilization measures that are common to standard engineering practice in California and implemented throughout the greater San Francisco Bay Area without secondary impacts on the environment.

Mitigation Measure M-MS-HY-1: Prescribed Burn Use of Best Management Practices for Protection of Water Quality

For mitigation projects that involve the use of prescribed burns for either construction or operations (e.g., Adobe Gulch, site MS-7), the SFPUC shall include BMPs for water quality protection as part of prescribed burn planning. The SFPUC will specifically plan all prescribed burns to control erosion after the burn to prevent sediment runoff into streams, reservoirs, and wetlands, including measures, for example, to select fire line locations and consider weather, fuel, soil, and topographic conditions; to avoid intense burns that remove forest floor litter; to avoid burning piles of slash in riparian management zones; and to use natural or existing barriers (e.g., roads, streams, lakes) where possible. BMPs following a prescribed burn include using erosion control measures for fire lines that could erode soil into lakes, streams, and wetlands; revegetation; and the installation of water bars.

Mitigation Measure M-MS-HZ-1: Environmental Site Assessment

For mitigation sites with the potential to encounter hazardous materials in soils or groundwater (e.g., Skyline Quarry, site MS-4, and Half Moon Bay/Pilarcitos, site MS-9), the SFPUC shall retain a qualified environmental professional to conduct the following activities:

- Update the environmental database review to identify permitted hazardous materials and environmental cases within 0.25 mile of the project area.
- Conduct soil sampling to: (1) assess concentrations of metals for which California has established hazardous waste criteria, and that were not previously analyzed for, and (2) evaluate soil and/or groundwater quality in the vicinity of any sites identified through the updated environmental database review as having the potential to affect soil or groundwater in the project area
- Prepare a report documenting the activities performed, summarizing the results, and making recommendations for appropriate handling of soil and groundwater during construction
- Prepare a contingency plan identifying measures to be taken should unanticipated contamination be identified during construction

Measure M-MS-HZ-2: Hazardous Building Materials Survey and Disposal Requirements

For any demolition of existing buildings or facilities (e.g., Skyline Quarry, site MS-4, and Half Moon Bay/Pilarcitos, site MS-9), the SFPUC will retain a registered environmental assessor or a registered engineer to perform a hazardous building materials survey for each structure prior to demolition or renovation activities. If any friable asbestos-containing materials, lead-containing materials, or hazardous components of building materials are identified, adequate abatement practices, such as containment and/or removal, will be implemented prior to demolition or renovation. Any PCB-containing equipment or fluorescent lights containing mercury vapors will also be removed and disposed of properly.

Mitigation Measure M-MS-HZ-3: Prescribed Burn Measures

For mitigation projects that involve the use of prescribed burns for either construction or operations (e.g., Adobe Gulch, site MS-7), the SFPUC shall implement the following measures to reduce the risk of hazards associated with wildland fires.

Prescribed Burn Planning: To manage the use of prescribed burns, the SFPUC will designate a qualified fire manager to oversee all burn operations. All prescribed burns will have a defined burn plan. The fire manager will determine what type of plan is necessary, and the plan will be subject to his/her approval. Burn plan components will include, but are not limited to, crew size and qualifications, health and safety measures, pre-burn site preparation, onsite equipment, ignition method, medical plan, contingencies, emergency contacts, smoke management, and holding, patrol, and mop-up standards.

The SFPUC fire manager will ensure containment measures are developed and implemented prior to the start of prescribed fire burns. Fire control lines will be constructed around the perimeter of the area to be burned, and extra suppression resources will be made available during the burning operation. In addition, a contingency plan will be developed prior to burning to account for possible emergencies. Burning will be monitored and limited so that acceptable levels of air quality are not exceeded.

The SFPUC will ensure that burns are not left unattended at any time and are monitored until they are out. Cleanup actions will be completed before the prescribed burn crews leave the defined burn area, as defined in the prescribed burn plan. The burn area will be inspected the morning following a prescribed burn. The SFPUC fire manager will make the required notifications regarding the completion of a prescribed burn.

Summary

The potential impacts of biological mitigation measures on other environmental resources, including land use and aesthetics, could be mitigated through application of avoidance measures, site selection, project design measures, and typical measures such as EIR Mitigation Measure M-LU-1a (Neighborhood Notice) and Mitigation Measure M-AE-1 (Landscaping Plans). Short-term impacts associated with construction could include temporary effects related to noise, air quality, traffic, recreation, utilities, geology, water quality, hazards, and energy, but these effects would be prevented through standard construction measures, best management practices, and other measures similar to the mitigation measures described in Sections 5.2 through 5.18 of this EIR. Application of the mitigation measures described above would reduce any impacts of mitigation measures to less than significant levels.

5.13.3.8 Cumulative Impacts

Impact C-BI: Cumulative loss of sensitive biological resources during construction and operation.

The geographic scope of potential impacts on biological resources encompasses the jurisdictional waters, sensitive habitats, riparian habitat, and common habitat within the project area as well as biologically linked areas in the Peninsula watershed. This section of the EIR evaluates the impacts of the LCSDI project on biological resources, including jurisdictional waters, sensitive habitats as defined by the CDFG, as well as local ordinance-protected trees, special-status plant and wildlife species, and riparian habitat potentially subject to state and federal protection. For the LCSDI project, mitigation measures that address these resources (Mitigation Measures M-BI-1 through M-BI-8, described above) would provide a substantial reduction in impacts as well as benefits and additional protection to affected biological resources.

However, there could be cumulative impacts on sensitive biological resources located throughout the watershed area when the impacts of the project are considered in combination with the impacts of other past, present, and reasonably foreseeable future projects in the vicinity, as listed and described in Section 5.1, Overview, of this chapter. Compliance with applicable state and federal regulations protecting biological resources, EIR mitigation measures, and project-specific permitting requirements would mitigate these cumulative effects to some extent. Two of the SFPUC projects (Polhemus Creek Restoration and the Habitat Reserve Program) are habitat improvement projects that are intended to provide a net benefit to biological resources and would not contribute to long-term, adverse cumulative impacts on sensitive species and habitats.

The WSIP PEIR acknowledged the mitigation provided through compliance with applicable conservation measures but identified potentially significant impacts associated with bioregional effects on sensitive biological resources due to the cumulative implementation of multiple WSIP projects in the Peninsula region, including the LCSDI as one of the projects contributing to this cumulative impact. The PEIR presented a mitigation measure (Mitigation Measure 4.16.4a) to provide additional regional protection of affected biological resources to ensure that the WSIP's contribution to these cumulative bioregional effects would be less than significant. PEIR Mitigation Measure 4.16.4a requires the SFPUC to address bioregional effects when implementing habitat compensation mitigation for the individual WSIP facility projects. The measure identifies the following conservation principles that should be considered in developing habitat compensation mitigation measures for individual WSIP facility projects:

- The parcels are either contiguous with other areas of relatively undisturbed habitat or are themselves large enough to support most of the species associated with the habitat.
- The distribution of mitigation lands will allow movement of plants and animals between them or from them to habitats otherwise conserved; and
- Implementation of habitat compensation mitigation for individual WSIP facility projects will be combined and implemented through a coordinated program with other mitigation efforts, such as through the Habitat Reserve Program (HRP), and shall meet these standards:
    - Long-term management of these lands stipulates maintaining natural disturbance regimes (e.g., through prescribed burning);
    - Long-term control actions for non-native species are applied; and
    - Contingencies are considered which address sharing biological materials and information with other conservation land stewards. This might include restoring suitable sites with plants brought from another protected area once a weed infestation has been brought under control, or animal relocation if done strictly for the purpose of genetic diversity or recovery and with the approval of the regulatory agencies.

Consistent with these conservation principles, the mitigation sites identified as examples in Mitigation Measure M-BI-1c (Wetlands Creation and Enhancement for Construction and Operational Impacts) and described above in Table 5.13-7 are contiguous with other areas of relatively undisturbed habitat or are themselves large enough to support most of the species associated with the habitat. Most of the mitigation sites would be located within the SFPUC Peninsula watershed, which is not subject to development pressure and is managed under the

SFPUC's adopted Peninsula WMP. Therefore, Mitigation Measures M-BI-1 through M-BI-8, described above, would be consistent with the analysis in the PEIR, and implementation of these measures would reduce the project's contribution to cumulative biological resources impacts on bioregional effects to less than significant.

There would be the potential for cumulative impacts specific to the amount of construction activity in the area around the Crystal Springs Pump Station and at the base of the LCSD. In addition to the proposed project, two other SFPUC projects—the Crystal Springs Pipeline No. 2 Replacement and Crystal Springs/San Andreas Transmission Upgrade—would involve construction in the same area below the dam near the LCSDI project between 2010 and 2013. Whether the activity occurs simultaneously or sequentially would not affect the totality of the disturbance to sensitive wildlife. However, within the outer limit of disturbance, the cumulative impact would be *potentially significant*, given the proximity of CRLF and SFGS. Implementation of Mitigation Measure M-C-BI (Coordination of Exclusion Fence and Biological Monitoring) in concert with Mitigation Measure M-BI-3b (Exclusion Fence), which would ensure that snake and frog exclusion fencing is installed below the LCSD, would help reduce the project's contribution to cumulative impacts on sensitive wildlife species to a less than cumulatively considerable level (less than significant with mitigation), provided that the fence is planned and constructed to include the totality of disturbance areas associated with all of the projects.

At the sampling station site, the project construction activities are scheduled to occur in the same location as and during or immediately after the SFPUC's Pulgas Discharge Channel Modifications project. This project area encompasses known habitat for CRLF and SFGS, and there would be a potential for cumulative impacts on these species. The Pulgas Discharge Channel Modifications project is currently under construction, and mitigation measures being implemented include provisions for installing and maintaining exclusion fencing around the excavation and staging areas, with biological monitors on site during construction. Depending on the timing of the proposed work at Sampling Station #5 and the location of the exclusion fencing for the discharge channel project, there could be a *potentially significant* impact on these species. However, implementation of Mitigation Measure M-C-BI (Coordination of Exclusion Fence and Biological Monitoring), in concert with Mitigation Measures M-BI-3b (Exclusion Fence) and M-BI-3c (Biological Monitoring), with the ongoing construction work, exclusion fence and biological monitoring for the Pulgas Discharge Channel Modification project would reduce the project's contribution to cumulative impacts to a level that is less than cumulatively considerable (less than significant with mitigation).

With respect to operational impacts, none of the identified projects listed in Section 5.1, Overview, Table 5.1-1 would result in operational impacts on biological resources. As stated above, two projects (Polhemus Creek Restoration and Habitat Reserve Program) are habitat improvement projects that would result in beneficial effects on biological resources and would not contribute to long-term cumulative impacts on sensitive species and habitats. Therefore, there would be no cumulative impacts on biological resources associated with operation of the LCSDI project when considered in combination with past, present, and foreseeable future projects.

5.13.3.9 Cumulative Mitigation Measures

Mitigation Measure M-C-BI: Coordination of Exclusion Fence and Biological Monitoring.

For project locations where the SFPUC has multiple, concurrent, or consecutive construction projects within sensitive species habitat, the SFPUC shall develop and implement a coordinated program in the placement, installation, and monitoring of the exclusion fence (see Mitigation Measures M-BI-3b and M-BI-3c, above). At the LCSD site, the fencing shall be constructed to encompass the construction and staging areas for all projects in this area and to last through the construction periods of all proposed projects in this area, including the LCSDI, Crystal Springs Pipeline No. 2 Replacement, and Crystal Springs/San Andreas Transmission Upgrade projects. Prior to construction at the sampling station site, the exclusion fencing installed for the Pulgas Discharge Channel Modifications shall be retrofitted as needed to encompass the construction activities and staging areas for Sampling Station #5 and shall be maintained throughout the duration of the construction.

5.13.4 References – Terrestrial and Wetlands

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5.13.5 Setting – Fisheries

This section describes fisheries resources in the vicinity of the Lower Crystal Springs Dam Improvements (LCSDI) project area and evaluates the potential impacts of project construction and operations on these resources, including sensitive fish species and aquatic habitats. While focusing on special-status fish species that could be affected, this section also considers the aquatic habitats capable of supporting such species as well as the riparian habitats immediately adjacent to stream channels that may influence the quality of aquatic habitats. This section discusses only those resources specific to fisheries. With regard to the Sampling Station #5 component of the LCSDI project, no fisheries resources exist along the Pulgas Discharge Channel, and construction and operation of this project component would have no impact on fisheries; therefore, fisheries resources at the Sampling Station #5 site are not discussed further in this section.

5.13.5.1 Information Sources and Methodology

The principal source of information for this analysis is a habitat survey report that details habitat conditions as well as the status and distribution of steelhead/rainbow trout (*Oncorhynchus mykiss*) in San Mateo and Laguna Creeks (ENTRIX, 2009). This technical report, summarized here and included as Appendix K of this document, presents the methods and results of recent fish habitat surveys conducted for the proposed project.

5.13.5.2 Definitions and Study Area

Steelhead/Rainbow Trout

For purposes of management under the Federal Endangered Species Act (FESA), the National Marine Fisheries Service (NMFS) defines *steelhead* to include resident rainbow trout that inhabit streams and rivers downstream of impassable reservoirs and other barriers to migration, such as the Lower Crystal Springs Dam (LCSD). Thus, trout inhabiting the stream upstream of LCSD are considered *resident rainbow trout*, while trout downstream of the dam (i.e., those that could complete an anadromous lifecycle) are assumed to be steelhead.

Distinct Population Segment (DPS)

Distinct Population Segment (DPS) is defined as a vertebrate population or group of populations that is discrete from other populations of the species and significant in relation to the entire species. FESA provides for listing species, subspecies, or distinct population segments of vertebrate species (NMFS, 2009).

Project Area/Study Area

For this analysis, the *project area* is defined as the riverine and lacustrine aquatic habitat supporting fish assemblages in the Upper and Lower Crystal Springs Reservoirs, as well as the habitats in tributary streams upstream and downstream of the reservoirs that could be directly affected by project construction or operation. This includes areas upstream of the reservoir where proposed operations would increase water levels along tributary streams, altering habitat in the inundated channels, and areas downstream of the reservoir at the base of LCSD where construction activities for the stilling basin and creek protection would affect riparian and aquatic habitat in lower San Mateo Creek. The *study area* includes the project area plus areas immediately adjacent to the project area where indirect impacts might occur; specifically, the study area includes the aquatic and riparian habitat in lower San Mateo Creek downstream of the defined project area that could be indirectly affected by construction activities at the toe of LCSD.

5.13.5.3 Regional Setting

San Mateo Creek and its tributary watersheds, including Laguna and San Andreas Creeks, are tributary to the southern portion of San Francisco Bay (see Section 5.15, Hydrology and Water Quality, for further description). San Mateo Creek flows into South San Francisco Bay approximately 1.6 miles south of the Hayward–San Mateo Bridge. Streamflow and associated fishery habitat within the San Mateo Creek watershed are affected by seasonal patterns in local rainfall and runoff, as well as by San Andreas Dam (constructed in 1870), Upper Crystal Springs Dam (constructed in 1877), and LCSD (constructed in 1890). LCSD is a barrier to upstream migration by Central California Coast (CCC) steelhead DPS.

The most common species inhabiting the watershed are steelhead/rainbow trout (*Oncorhynchus mykiss irideus*) and threespine stickleback (*Casterosteus aculeatus*) (Leidy et al., 2005); other species present include sucker (*Catostomus occidantalis*), tule perch (*Hysterocarpus traskii*), and sculpin (*Cottus* sp.) (San Francisco Planning Department, 2008). Sculpin and perch inhabit the upper part of the watershed, while Sacramento sucker, sculpin, and stickleback (as well as carp [*Cyprinus carbio*]) are found within the lower reaches of San Mateo creek (San Francisco Planning Department and SFPUC, 2008).

The San Mateo Creek watershed originates in undeveloped lands upstream of Lower Crystal Springs Reservoir and continues downstream of LCSD through urbanized areas adjacent to South San Francisco Bay. The creek corridor within this downstream urban region has been highly modified. Changes in channel structure and function as a result of reservoir impoundments and channel modifications have affected instream habitat for steelhead and other fish species. In 1860, prior to construction of San Andreas and Upper and Lower Crystal Springs Reservoirs, steelhead/rainbow trout were collected from San Mateo Creek (Leidy et al., 2005). Leidy et al. (2005) concluded that San Mateo Creek historically supported resident rainbow trout populations, and that small numbers of steelhead may have utilized the creek downstream of Crystal Springs Reservoir as spawning and juvenile rearing habitat.

5.13.5.4 Aquatic Habitats and Fish Assemblages

Aquatic habitats in the project area are divided into riverine and lacustrine habitats. Upper and Lower Crystal Spring Reservoirs provide extensive lacustrine habitats in the project area. Lacustrine habitats are defined as inland depressions or dammed riverine channels containing standing water. Riverine habitats in the project area are composed of San Mateo Creek (upper and lower) and Laguna Creek and its tributaries. The following section describes the aquatic habitats and fish assemblages in the study area.

Riverine Habitats and Fish Assemblages Upstream of Crystal Springs Reservoir

Upper San Mateo Creek represents the primary tributary to Lower Crystal Springs Reservoir; flow from San Andreas Creek to Crystal Springs Reservoir is largely blocked by an impassable berm with a surface road and water control structure at the downstream confluence with the reservoir. Laguna Creek enters the south end of Upper Crystal Springs Reservoir near the Pulgas Water Temple.

Upper San Mateo Creek

Upper San Mateo Creek drains the slopes to the northwest of the Lower Crystal Springs Reservoir. A system of "mud" dams and tunnels along upper San Mateo Creek can divert flows from Pilarcitos Creek into San Mateo Creek. The creek sustains perennial surface flows in most years. Several short steep water courses contribute storm-related runoff to the reservoir, but these reaches are not characterized by sustained flow and are unlikely to support fisheries (ENTRIX, 2009).

Upper San Mateo Creek from Lower Crystal Springs Reservoir to the road crossing near the base of Mud Dam No. 2 provides spawning and year-round rearing habitat for reservoir-dwelling rainbow trout. Mud Dam No. 2 is an impassable barrier to fish passage. ENTRIX (2009) evaluated the aquatic habitat within this section of upper San Mateo Creek from the reservoir to the road crossing below Mud Dam No. 2 and identified three distinct reaches (see **Figure 5.13-5**):

- The *existing inundation reach*, representing the reach of upper San Mateo Creek that is currently inundated by periodic water level fluctuations, up to elevation of about 272 feet
- The *potential future inundation reach*, representing the reach of upper San Mateo Creek from about 272 to 292 feet in elevation that could become partially or completely inundated during reservoir operations under the proposed project
- The *canyon reach*, representing the area upstream of the potential future inundation reach from the 292-foot elevation to the unnamed road below Mud Dam No. 2, which would not be affected by the proposed project

The existing inundation reach extends for 1,088 linear feet from the confluence with Lower Crystal Springs Reservoir within the existing fluctuation zone of the reservoir, and has a valley bottom ranging from 70 to 200 feet wide created from more than a century of sediment deposition in a zone where the creek enters the reservoir. Shading is limited in the lower section where the valley is wide and exposed and where seasonal inundation prevents the growth of perennial species. In this area, riparian or bordering vegetation provide only limited shade. One redd[19] was counted in the existing inundation reach (ENTRIX, 2009).

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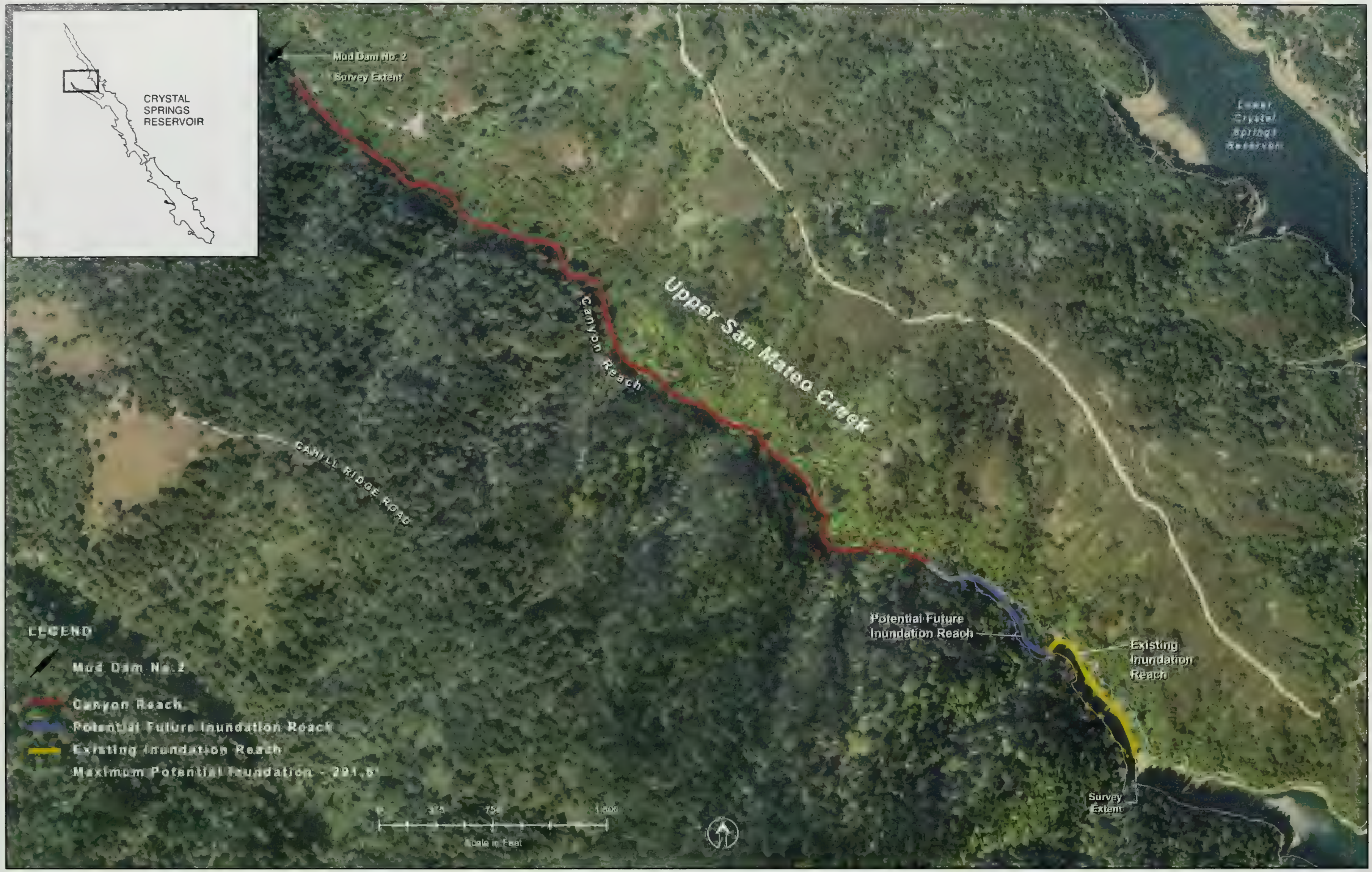
[19] A depression excavated by salmonids in the gravels of streambeds for the purpose of depositing eggs.



SOURCE: Entrix, 2009

SFPUC Lower Crystal Springs Dam Improvements

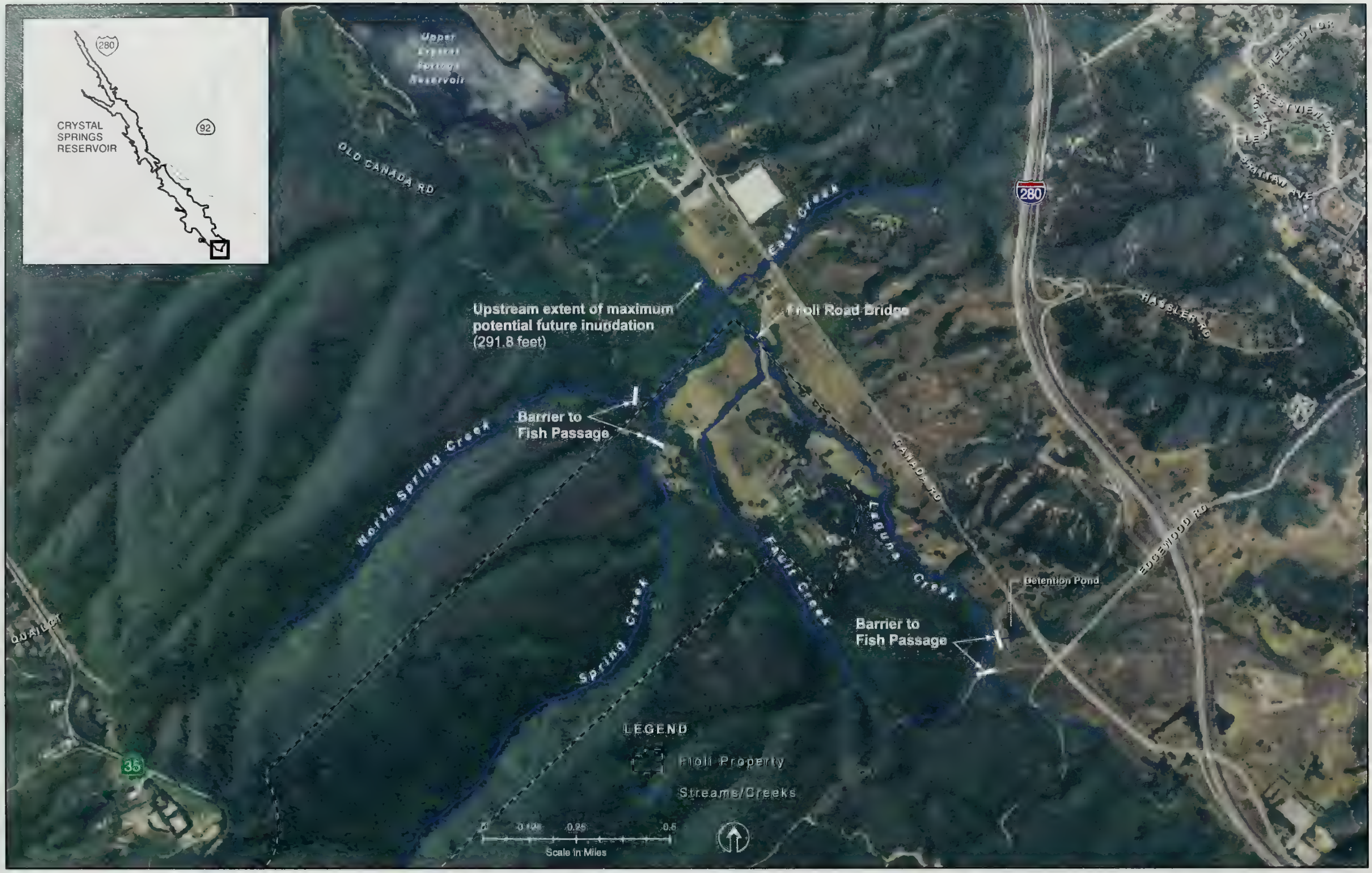
Figure 5.13-5
Upper San Mateo Creek
Aquatic Habitat Survey Extent

The potential future inundation reach extends for 1,091 linear feet upstream from the existing inundation reach. Within this reach, the San Mateo Creek channel is dynamic with a substrate of gravel, sand, and some cobble that is deposited, mobilized, and re-deposited in response to storm flows that occur over a range of reservoir water surface elevations. The stream channel in the downstream portion of this reach is poorly developed, with limited short pools and long runs and riffles. The upper narrower section upstream of the current fluctuation zone has well-established mature vegetation and is well-shaded by the canyon walls and adjacent trees. Ten potential spawning areas, ranging from 10 to 300 square feet and totaling 1,230 square feet, were identified within this reach during habitat surveys conducted by ENTRIX (2009). A total of four suspected redds were counted within this reach, but not all potential spawning areas were found to contain redds. Many of the sites classified as potential spawning habitat in this reach were classified based solely on suitable gravel size due to low flow conditions at the time the surveys were conducted (Taylor, Pers. Comm.). The low flow conditions meant it was not possible to accurately distinguish between sites that would provide suitable spawning locations based on substrate, flows, and geomorphology and those that simply had suitable gravels, but would not likely provide functional spawning habitat. This approach was considered the most conservative methodology for surveying habitat units. It is likely that only a portion of the 1,230 square feet of gravels surveyed would be suitable for spawning. The majority of the reach was relatively flat and the gravels did not provide the head of pool/tail of riffle habitat optimal for salmonid spawning and egg incubation (Taylor, Pers. Comm.).

The canyon reach is well-shaded by steep topography and a canopy of coast live oaks (*Quercus agrifolia),* California laurel (*Umbellularia californica*), and big leaf maple (*Acer macrophyllum*). The gradient is steeper in the canyon reach than in the potential future inundation reach, and increases sharply as the channel nears the road below Mud Dam No. 2. Substrates range from boulders to gravel and sand. The aquatic habitat is well-developed with cascades, riffles, runs, and pools. The canyon reach extends for 5,806 linear feet from the upper end of the potential future inundation reach to the road crossing downstream of Mud Dam No. 2, and includes several tributaries that contribute small volumes of inflow to the creek but are too steep to support fish habitat directly. During habitat surveys, ENTRIX located 30 potential spawning areas in this reach, ranging from 5 to 300 square feet, for a total area of 1,220 square feet. Ten suspected redds were identified at 6 sites, with 26 other potential spawning sites. Three sites contained multiple redds, two sites contained two redds each, and another site contained three redds. Identified redds were present at about a quarter of the potential spawning sites identified in the canyon reach (ENTRIX, 2009).

Laguna Creek

The geology and topography of Laguna Creek is very different from that of upper San Mateo Creek (**Figure 5.13-6**). Rather than being contained within a deep canyon, the Laguna Creek system occurs within a small, broad, dry valley that is strongly influenced by and parallels the San Andreas Fault. Laguna Creek flows into the south end of Upper Crystal Springs Reservoir near the Pulgas Water Temple. The channel in this reach is deeply incised in sands and clays where the channel has cut through a road berm fitted with culverts just downstream of an area



SOURCE: Entrix, 2009

SFPUC Lower Crystal Springs Dam Improvements
Figure 5.13-6
Laguna Creek and Tributaries

formerly used as a sediment detention area. Based on observations during habitat surveys conducted in 2007 (ENTRIX, 2009), Laguna Creek does not sustain year-round flows in most years. The creek has three headwater channels: one from the east, one from the west, and the main channel from the south. A short reach of one of its tributaries, Spring Creek, sustains year-round surface water in most years. However, this reach is upstream of a passage barrier and is not presently accessible to fish from the reservoir.

The Laguna Creek system provides spawning and early fry rearing habitat, but does not support year-round rearing for rainbow trout due to the lack of year-round surface flows. The reach of Laguna Creek that would be inundated due to proposed operations is located within the incised channel section characterized by sands and clays where the channel has cut through a road berm. While spawning gravels were identified at multiple sites within the accessible portions of the Laguna Creek system, no spawning habitat downstream of the Filoli Road Bridge was identified, including all channel segments that would be inundated up to and well upstream of the maximum possible inundation level of 291.8 feet (as part of short-term exceedances). The channel bed within the reach that would be inundated by maximum normal water surface elevations being raised to 287.8 feet under the proposed project is composed of sand, with some areas of hardpan clay, and does not provide suitable spawning substrate (ENTRIX, 2009).

To summarize the aquatic habitat upstream of Crystal Springs Reservoir, habitat found within upper San Mateo Creek and the Laguna Creek system supports potamodromous[20] migration, spawning, incubation, and rearing of rainbow trout from Crystal Springs Reservoir. Upper San Mateo Creek is likely to be the only stream tributary to Lower Crystal Springs Reservoir providing potential spawning sites for resident rainbow trout below the proposed maximum surface water elevation of 291.8 feet (ENTRIX, 2009).

Lacustrine Habitats and Fish Assemblages in Crystal Springs Reservoir

A number of fish species are present within Crystal Springs Reservoir, including such native fishes as rainbow trout. Crystal Springs Reservoir also contains populations of Sacramento sucker, tule perch, and various species of sculpin (San Francisco Planning Department, 2008). During the Great Depression of the 1930s, bass were introduced to Crystal Springs Reservoir to serve as a food source. Although rainbow trout have been collected throughout the reservoir, native fish species such as Sacramento sucker, tule perch, and various sculpin species appear to be either absent or few in number. A variety of factors are thought to affect the abundance of resident fish within the reservoir, including predation by species such as largemouth bass and seasonal water quality conditions, such as the stratification and anoxic conditions exhibited by Crystal Springs Reservoir in late summer and fall (San Francisco Planning Department, 2008).

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[20] Potamodromous fish migrate within freshwater only, e.g., resident rainbow trout that exhibit migratory behavior upstream of impassable barriers.

Riverine Habitats and Fish Assemblages Downstream of Crystal Springs Reservoir

Lower San Mateo Creek extends downstream from the base of LCSD and flows in a northeasterly direction discharging into San Francisco Bay. The reach of lower San Mateo Creek downstream of the dam flows for about 1.5 miles through a steep-sided canyon in a natural channel and then flows through suburban and urban areas for about 5.2 miles before emptying to San Francisco Bay. Lower San Mateo Creek below LCSD receives flow from a variety of sources, including: surface runoff; local interflow (i.e., flow that reaches the creek by lateral movement of water through the subsurface unsaturated zone); seepage from Crystal Springs Reservoir; storm drains from roadways and the bridge over LCSD; and leakage flow from the Crystal Springs Pump Station. San Mateo Creek stream flow and hydrology is discussed in detail in Section 5.15, Hydrology and Water Quality, and is summarized here in the context of the aquatic habitat. Summer flows in lower San Mateo Creek between the base of LCSD and the confluence with Polhemus Creek has been estimated at 0.7 cubic feet per second (cfs), with about 0.6 cfs attributable to leakage from pipes and the remaining 0.1 cfs from seepage under and around the dam. Summer flows in lower San Mateo Creek immediately below the confluence with Polhemus Creek has been estimated at 1 to 2.6 cfs. During storms, flow in lower San Mateo Creek below LCSD increases rapidly to as much as an estimated 100 cfs. The rapid increase in flow is attributable to the discharge of stormwater runoff from Interstate 280 (I-280) and Skyline Boulevard into the stilling basin and subsequently into the creek.

No known complete barriers to adult salmonid passage have been identified in lower San Mateo Creek between the confluence with the Bay and the I-280 crossing, approximately 400 feet downstream of the base of LCSD. Lower San Mateo Creek supports both native and non-native fish species, including rainbow trout/CCC steelhead (*Oncorhynchus mykiss*), threespine stickleback (*Casterosteus aculeatus*), sculpin (*Cottus* sp.), Sacramento sucker (*Catostomus occidantalis*), and mosquito fish (*Gambusia affinis*) (ESA, 1994). Several large non-native carp (*Cyprinus carbio*) have been observed in pools immediately below the base of LCSD (ENTRIX, 2009).

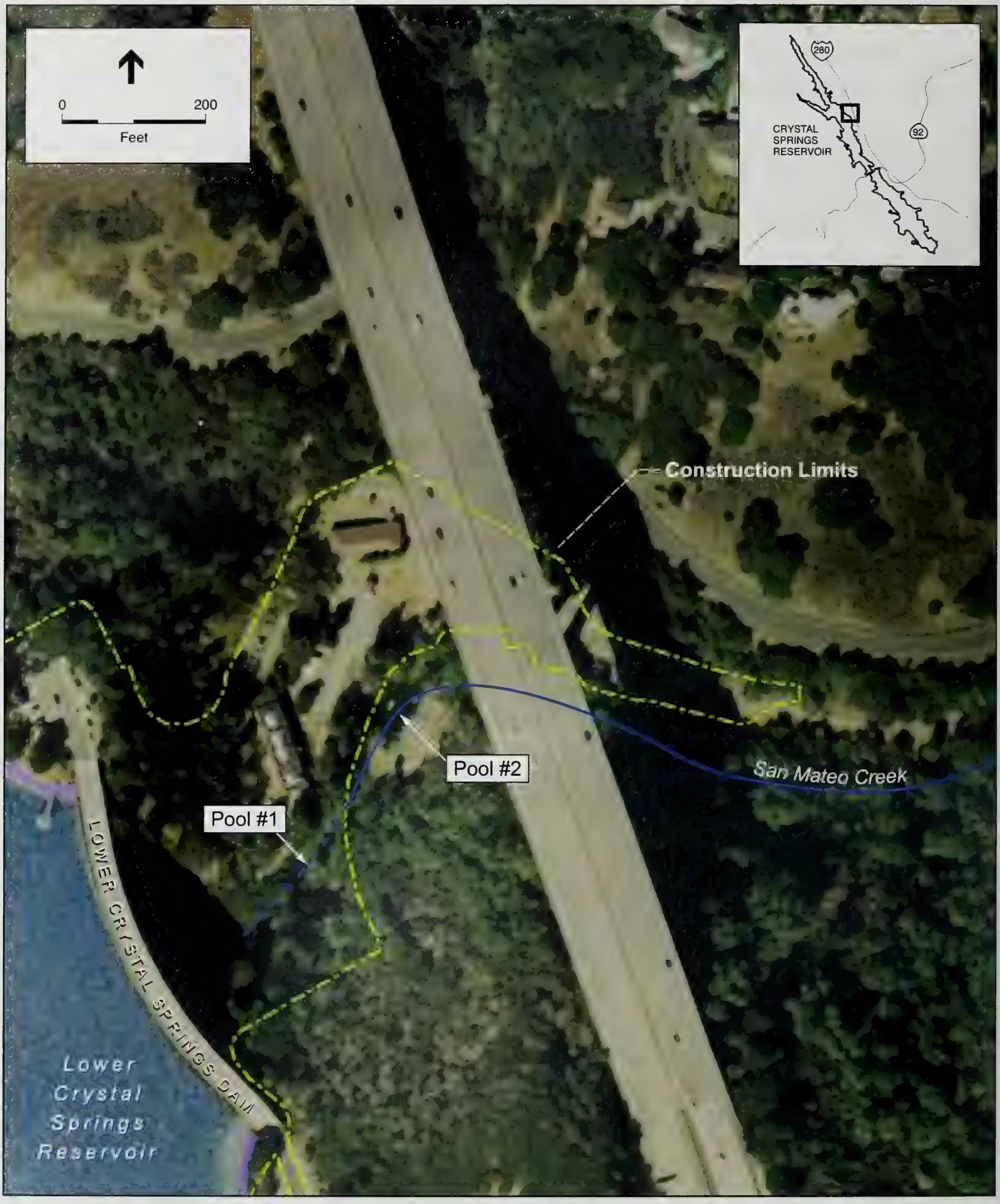
The area immediately below the existing stilling basin at the base of LCSD is occupied by riparian woodland. Surveys conducted in late summer 2008 identified a pool (Pool 1) located approximately 150 feet downstream of the existing stilling basin. Pool 1 is thought to have been created by previous releases from a 60-inch emergency discharge valve. The area between the downstream edge of the stilling basin and the upstream edge of Pool 1 is a shallow, poorly defined stream channel with an abundance of emergent vegetation. Fish observed in Pool 1, which is sustained by groundwater seepage and leakage from the 60-inch emergency discharge valve, consisted of carp and mosquito fish (ENTRIX, 2009). Pool 1 has a surface area of approximately 609 square feet and provides potential rearing habitat for juvenile steelhead, representing the upstream extent of habitat potentially suitable for steelhead. Pool 1 is well shaded by the riparian vegetation that borders it, allowing shading from solar radiation and subsequent maintenance of cooler water temperatures compared to unshaded portions of the creek. The established riparian vegetation also provides cover from avian predation as well as potential food sources through insect recruitment to the water column. Additionally, the subsurface seepage of groundwater from the base of LCSD likely maintains cool temperatures, with possible stratification in summer months, suitable for summer rearing steelhead.

Downstream of Pool 1, a slightly more developed channel occurs for approximately 150 feet and flows into a highly modified pool (Pool 2) formed by large volume discharges (controlled releases) from the reservoir. Pool 2 is characterized by armored banks for erosion control on the south bank opposite a series of discharge valves. Pool 2 is poorly shaded through a lack of riparian vegetation bordering it where banks have been armored. The exposed nature of Pool 2 likely results in warmer water temperatures compared to shaded portions of the creek. The lack of riparian vegetation around Pool 2 also potentially results in lack of cover from avian predation as well as a reduction of potential food sources from insect recruitment to the water column. Overall, the lack of riparian vegetation and shaded riverine aquatic cover likely limits the potential for Pool 2 to be utilized by summer rearing steelhead (Taylor, Pers. Comm.).

The channel connecting Pool 1 and Pool 2 is a poorly defined mud-bottomed channel that contains a dense growth of emergent vegetation. During habitat surveys conducted in late summer 2008 (ENTRIX, 2009), neither the channel from the stilling basin to Pool 1 nor the channel connecting Pool 1 and Pool 2 provided habitat of direct value to steelhead. The poorly defined channel with dense emergent vegetation downstream of Pool 1 does not support perennial flows suitable for steelhead passage during summer months. This lack of hydrologic connection combined with the presence of large non-native carp likely results in Pool 1 having limited habitat function for steelhead (Taylor, Pers. Comm.). A more typical channel exists downstream of Pool 2, and lower San Mateo Creek is perennial from Pool 2 to the confluence with the Bay. **Figure 5.13-7** shows the general locations of Pools 1 and 2 along lower San Mateo Creek downstream of LCSD.

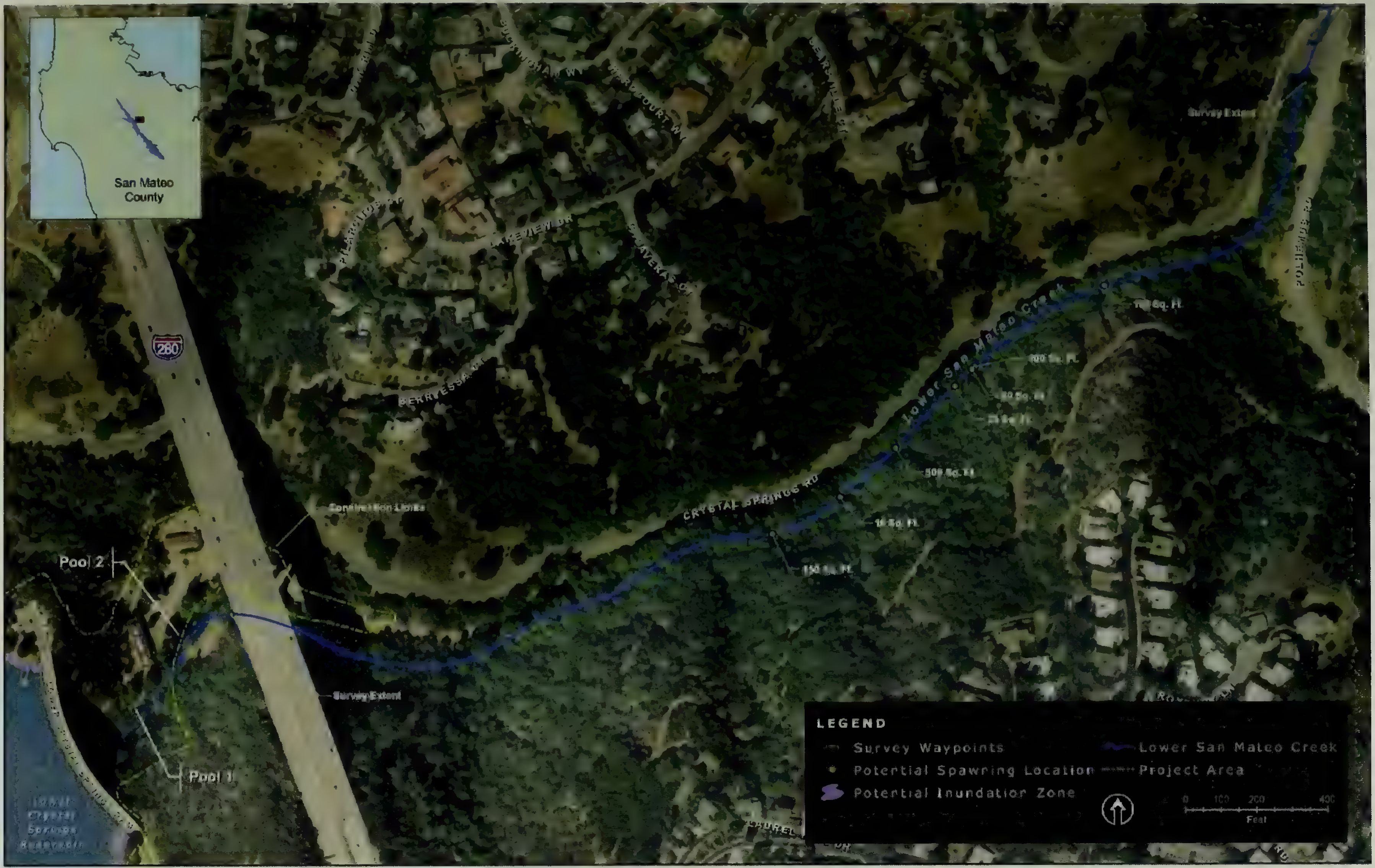
Overall, habitat to support rainbow trout/steelhead is in good to fair condition throughout lower San Mateo Creek from about 1 mile downstream of Pool 2 to De Anza Park near El Camino Real in the city of San Mateo. The reach is characterized by riffles, runs, and pools bordered by a riparian zone that shades the creek (ENTRIX, 2009). Habitat conditions from the downstream edge of Pool 2 to Polhemus Creek can be characterized by conditions that potentially support migration and spawning of adult steelhead and incubation and rearing of fry and juvenile steelhead.

Habitat conditions upstream of Pool 2 to the base of the existing stilling basin is fragmented and characterized by shallow, poorly defined channels connecting two deep scour pools formed by reservoir discharge operations; this area is unlikely to support any life stages of steelhead. Pools 1 and 2 may provide limited summer rearing habitat for steelhead. No potential spawning areas characterized by high quality spawning gravels were identified within ½ mile of the LCSD. During habitat surveys, seven potential spawning sites were identified between the intersection of Crystal Springs and Polhemus Roads and the I-280 crossing (**Figure 5.13-8**). The total area of potential spawning substrate in this reach was estimated at 951 square feet, with individual sites ranging from 16 to 500 to square feet. Potential spawning substrate in San Mateo Creek upstream of Polhemus Creek is very poor relative to substrate conditions downstream of Polhemus Creek.


0
200
Feet
280
92
CRYSTAL SPRINGS RESERVOIR
Construction Limits
Pool #2
Pool #1
San Mateo Creek
LOWER CRYSTAL SPRINGS DAM
Lower Crystal Springs Reservoir

SOURCE: Entrix, 2008

Figure 5.13-7
Location of Pool #1 and Pool #2 at Base of Lower Crystal Springs Dam



SOURCE: Entrix, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.13-8
Surveyed Salmonid Spawning Habitat in Lower San Mateo Creek Upstream of Polhemus Creek

Upstream of Polhemus Creek, the substrate is angular, which does not easily support successful spawning. Angular substrate tends to lock in place, thus requiring substantially more effort for fish to construct redds in this material than in rounded river rock. The angular rock causes more fin abrasion during redd construction, resulting in physical damage to spawning fish. No redds were observed within this reach of the creek during surveys conducted during the 2007 season (ENTRIX, 2009). The lack of rounded river rock is likely due to the 100+ year presence of LCSD, which has completely eliminated sediment transport past the dam.

5.13.5.5 Special-Status Fish Species

One federally listed fish species was determined to have the potential to occur in the study area: the CCC steelhead (*Oncorhynchus mykiss*) DPS.

Central California Coast Steelhead DPS

Status, Distribution, and Habitat Requirements

The CCC steelhead DPS is federally listed as threatened. Historically, steelhead likely inhabited most coastal and inland streams in Washington, Oregon, and California. The current range of steelhead extends from the Kamchatka Peninsula south to at least Malibu Creek in Southern California, although populations have declined significantly in recent decades. The historical range of CCC steelhead includes coastal streams from the Russian River (in Sonoma County) south to and including Soquel Creek (in Santa Cruz County). This range includes streams tributary to San Francisco Bay. Adult steelhead migrate upstream from the ocean into coastal or Bay tributaries during the wet season from late December to April, and spawn in the gravel-cobble substrate of coldwater streams. Peak migration and spawning occurs during the winter spawning period of February through April. Fertilized eggs hatch in about four weeks. Young fish do not immediately leave the gravel, but emerge into the river two to three weeks after hatching as fry, to begin feeding in the stream. Some individuals begin to disperse downstream in the months following emergence, but most continue to rear in the stream for a period of up to two years before migrating to the Bay and eventually the ocean to grow to adults.

Oncorhynchus mykiss exhibit two basic life history patterns: migratory and resident. Both types often exist in the same population. Steelhead that migrate to the ocean undergo physiological changes in the process of smoltification that allow them to adapt to seawater. Some variable fraction of *Oncorhynchus mykiss* within any given stream remain in freshwater even when the ocean is readily available to them. These fish can spawn without ever entering the ocean and typically spend their entire life cycle within a few hundred feet of the stream, but may exhibit more extensive instream migratory behavior to find suitable spawning grounds. In California, many streams support both resident and anadromous forms with no observable genetic differentiation. Rainbow trout observed in freshwater habitat may be the offspring of either anadromous or resident fish; it is not possible to distinguish them based on external characteristics. During extended drought periods, it is possible for populations to sustain themselves through resident spawning and then revert to anadromy when suitable conditions return.

Steelhead usually spawn in the tail of pools or in riffles with gravel substrate (Moyle, 2002). The eggs and newly hatched fry (alevins) buried in the gravel require a constant flow of water through the gravel to provide dissolved oxygen and to carry away metabolic waste products. This water exchange is a function of local stream gradient and substrate composition. If fine sediments accumulate within or over the redd, they can interfere with water exchange and adversely affect the survival or development of eggs and alevins, and potentially result in mortality (Björnn and Reiser, 1991). Steelhead alevins emerge from the gravel approximately five to eight weeks after the eggs have been deposited, between March and May, depending on time of spawning and water temperature, dissolved oxygen concentration, and substrate composition (Shapovalov and Taft, 1954; Moyle, 2002).

Steelhead fry and juveniles feed on a variety of invertebrates, including aquatic and terrestrial insects, amphipods, and snails (Moyle, 2002). After emergence, steelhead fry frequently inhabit shallow water along stream margins. As the fry grow larger, the schools disperse and individuals establish territories. Young-of-the-year steelhead often utilize riffle and run habitat during the growing season and move to deeper slower water habitat during the winter season. Larger juvenile steelhead, usually yearlings or older, often use heads of pools for feeding stations. Pools provide important over-summer refugia for juvenile trout in small streams during low-flow conditions.

The California Department of Fish and Game (CDFG) has used a daily average temperature of 20° C (68° F) or lower to describe suitable thermal conditions for steelhead in California. This temperature represents a level below which reasonable growth of rainbow trout may be expected. In general, rainbow trout/steelhead in warmer water require more food and oxygen because their metabolism increases with temperature (Moyle, 2002).

For the purpose of this document, all *Oncorhynchus mykiss* present in lower San Mateo Creek downstream of LCSD are assumed to be steelhead.

Critical Habitat

Critical habitat for the CCC steelhead DPS was designated in September 2005 (NMFS, 2005). The bayside streams north of San Francisquito Creek, including San Mateo Creek, are excluded from the critical habitat designation; therefore, San Mateo Creek is not currently designated as critical habitat for steelhead.

Occurrence in the Study Area – San Mateo Creek

Steelhead were documented in San Mateo Creek prior to the construction of Upper Crystal Springs Dam in 1877 and LCSD in 1890. Fish sampling conducted above LCSD in 1988 and downstream of the dam in 1981, 1991, and 1993 all documented *Oncorhynchus mykiss* ranging in size from 50 to 280 millimeters (Leidy et al., 2005). In addition, in October 2008, fishery habitat surveys were conducted to establish baseline aquatic habitat conditions within lower San Mateo Creek (ENTRIX, 2009). Four species of fish were captured, including steelhead, prickly sculpin, threespine stickleback, and Sacramento sucker. As described above, lower San Mateo Creek contains a mix of fair to good habitat for spawning, rearing, and over-summering, with some areas subject to bank erosion and channelization. No critical barriers to fish passage have been observed downstream of LCSD. Steelhead of multiple size classes have been observed throughout the entire stream reach between the base of LCSD and the confluence with San Francisco Bay. This reach of stream has a well-developed riparian corridor, frequent shallow to moderately deep pools, undercut banks, rootwad, small woody debris, overhanging vegetation, and partially silted gravelly substrate for spawning. Recent observations and results of electrofishing surveys indicate that reproduction is occurring within the creek, multiple age classes of trout are present, and fish are of good body weight for their length. Estimated *Oncorhynchus mykiss* densities ranged from 1,278 to 2,125 fish per mile (average of 1,764) during the October 2008 surveys (ENTRIX, 2009).

5.13.6 Regulatory Framework – Fisheries

The regulatory framework presented in Section 5.13.2 for terrestrial and wetlands biological resources is inclusive of relevant regulations governing fisheries resources.

5.13.7 Impacts and Mitigation Measures – Fisheries

5.13.7.1 Significance Criteria

The significance criteria described for biological resources in Section 5.13.3.1 generally apply to fisheries resources as well. However, criteria specifically applicable to fisheries are identified below.

The City and County of San Francisco has not formally adopted significance standards for impacts related to biological resources, but generally considers that implementation of the proposed project would have a significant impact on fisheries resources if it were to:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFG, U.S. Fish and Wildlife Service (USFWS), or NMFS;

- Have a substantial adverse effect on any riparian habitat;

- Interfere substantially with the movement of any native resident or migratory fish, or impede the use of native fish nursery (rearing) sites;

- Have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife species population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, or substantially reduce the number or restrict the range of an endangered, rare, or threatened species;

- Conflict with any local policies or ordinances protecting biological resources; or

- Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved plan.

5.13.7.2 Approach to Analysis

The impact analysis is divided into two broad categories: Construction and Operation. Construction impacts are the measurable effects of the project's construction footprint; the LCSDI project could adversely affect creek and riparian resources along lower San Mateo Creek due to construction activities and staging areas needed at the base of the dam. The stilling basin area at the base of the dam would be reconstructed and some wetland habitat would be lost. This could cause direct impacts on in-channel aquatic habitat, as well as on resident fish that could be injured, stranded, or displaced to other areas with potential exposure to increased predation. Indirect impacts could occur beyond the limits of construction to both habitat and resident fish species, if the project were to result in increased downstream sedimentation of the watercourse (for further discussion on erosion and sedimentation please refer to Section 5.15, Hydrology and Water Quality).

Operationally, the proposed project would allow Upper and Lower Crystal Springs Reservoirs to be maintained higher than the current reservoir levels, and the reservoirs would operate within a higher range of elevations, thus altering the inundation zone from current conditions. As described in Section 5.13.3, Terrestrial Biological Resources Impacts and Mitigation Measures, the result would be an increase in lacustrine habitats as adjacent upland and riverine areas are flooded at the upper extent of inundation.

For the purpose of this EIR, the word "substantial" as used in the significance criteria (above) has three principal components, each of which contributes to the determination of impacts on biological resources and their significance:

- Magnitude and duration of the impact (e.g., substantial/not substantial)
- Uniqueness of the affected resource (rarity)
- Susceptibility of the affected resource to disturbance

The evaluation of significance must also consider the interrelationship of these three components. For example, a relatively small-magnitude impact on a state or federally listed species could be considered significant because the species is rare and is believed to be very susceptible to disturbance. Conversely, a natural fish population such as prickly sculpin is not necessarily rare or sensitive to disturbance, and thus, a much larger magnitude of impact would be required to result in a significant impact. Impacts on biological resources are considered *significant* when project-related habitat modifications (e.g., development, introduction of non-native plant or animal species, increased human intrusion, barriers to movement, or landscape management) could reduce species populations to the extent that they become locally less numerous; impacts on habitats are considered *significant* when the habitats could not continue to support viable populations of associated fish species as a result of project implementation. *Potentially significant* impacts are those that might not be sufficiently reduced through non-discretionary regulatory standards (see below). For impacts determined to be either significant or potentially significant, mitigation measures are identified to reduce those impacts to a less-than-significant level.

5.13.7.3 Impact Summary

Table 5.13-8 summarizes the impacts related to fisheries resources.

TABLE 5.13-8
SUMMARY OF IMPACTS – FISHERIES

	Significance Determination	
Impact	**LCSD Site**	**Sampling Station Site**
Impact BI-11: Construction impacts on fisheries due to water quality effects from increased sediment and turbidity and contaminant releases.	PSM	N/A
Impact BI-12: Disturbance and direct injury to steelhead from construction.	SM	N/A
Impact BI-13: Loss of riparian vegetation, shaded riverine aquatic cover, and aquatic habitat area.	SM	N/A
Impact BI-14: Reduction in streamflows downstream of construction area.	LS	N/A
Impact BI-15: Inundation of approximately 1,500 linear feet of riverine habitat.	LS	N/A
Impact C2-BI: Cumulative impacts on fisheries.	LS	N/A

B = Beneficial impact
N/A = Not Applicable or no impact
LS = Less than Significant impact, no mitigation required
SM = Significant impact, can be Mitigated to less than significant
PSM = Potentially Significant impact, can be Mitigated to less than significant
SU = Significant Unavoidable impact
PSU = Potentially Significant Unavoidable impact

5.13.7.4 Construction Impacts

Under the proposed project, the existing 102-foot-wide by 32-foot-long stilling basin at the toe of LCSD would be demolished. The new stilling basin would be 154 feet wide (extending along the toe of the dam) and 125 feet long (extending along San Mateo Creek). A line of concrete sill blocks perpendicular to the direction of water flow would be built within the new stilling basin near its downstream end. A 20-foot section of the stilling basin downstream of the concrete sill blocks would include grouted riprap, and an additional 20 linear feet of riprap would be installed in the creek channel downstream of the new stilling basin. The concrete sill blocks and the grouted riprap would dissipate energy and slow the flow of water before it enters lower San Mateo Creek.

In this impact analysis, it is assumed that the LCSDI project would comply with the SFPUC's *Peninsula Watershed Management Plan* (WMP) policies (SFPUC, 2002). All of the WMP policies listed above in Section 5. 13.2, Terrestrial Biological Resources Regulatory Framework, would help to minimize impacts on biological resources. Where necessary and if possible, additional measures are proposed to reduce project impacts to less than significant. Mitigation Measure

M-BI-1a (Worker Training Program), described in Section 5.13.3, Terrestrial Biological Resources Impacts and Mitigation Measures, is a program to communicate the LCSDI project commitments to the construction workers and contractor supervisors who would be involved in on-the-ground project implementation; this measure would be applicable to all potentially significant and significant fisheries-related construction impacts.

Impact BI-11: Construction impacts on fisheries due to water quality effects from increased sediment and turbidity, and contaminant releases.

Site clearing, facility demolition, dewatering, earthwork, and facilities construction adjacent to and within the stream channel of lower San Mateo Creek would result in temporary disturbance of soil and streambed sediments in the construction area near the base of LCSD. These activities could result in temporary increases in turbidity and suspended sediments in the creek. In addition, dewatering at construction sites could result in temporary increases in turbidity and suspended sediments in the creek at the point of discharge as well as downstream in the creek. Increased turbidity and concentrations of suspended sediment can have both direct and indirect effects on fish. Increased sediment loading and turbidity can affect steelhead both directly and indirectly through reduced foraging ability, reducing predator avoidance potential, loss of spawning habitat through siltation of potential spawning gravels, direct mortality to incubating eggs from suffocation due to inundation by fine material, and reduced respiratory ability of fish through sedimentation of gills. Due to the high sensitivity of steelhead as a biological resource in lower San Mateo Creek, this would be a *potentially significant* impact.

Project actions that involve the storage, use, or discharge of toxic and other harmful substances near San Mateo Creek, or in areas that drain to the creek, could result in contamination of the creek and potentially affect fish. Potential effects on fish can range from avoidance of habitat in the vicinity to mortality; this could occur through exposure to lethal concentrations or exposure to nonlethal levels that cause physiologic stress and increases susceptibility to other sources of mortality (e.g., predation, disease). The potential magnitude of biological effects resulting from accidental or unintentional release of contaminants into lower San Mateo Creek would depend on a number of factors, including the proximity of spill, type of contaminant, amount, concentration, solubility, timing, and duration of discharge. Contaminants can affect survival and growth rates, as well as the reproductive success of fish. The level of effect depends on life-stage sensitivity, duration and frequency of exposure, condition/health of individuals, and physical and chemical properties of the water. Due to the high sensitivity of fisheries resources in lower San Mateo Creek, this would also be a *potentially significant* impact.

Implementation of Mitigation Measure M-BI-1a (Worker Training Program) would reduce these impacts by training workers on general resources impact avoidance. Mitigation Measure M-BI-1b (Avoidance and Restoration) would provide specific procedures such as placement of straw rolls (weed free) (or similar erosion control devices) and installation of silt fences to reduce sedimentation and turbidity in the channel. As described in Section 5.15, Hydrology and Water Quality, Mitigation Measure M-HY-3 (Preparation of a SWPPP) includes specific measures to protect salmonids and aquatic habitat, which would mitigate potential impacts on steelhead from construction-related sedimentation, turbidity, and hazardous materials spills. The combined implementation of the actions described in Mitigation Measures M-BI-1a, M-BI-1b, and M-HY-3 would reduce the water quality related impacts on steelhead from project construction to a less-than-significant level.

Impact BI-12: Disturbance and direct injury to steelhead from construction.

Construction activities occurring within the stream channel or immediately adjacent to the channel are the most likely to disturb fish or cause injury or mortality, and could potentially trap, strand, stress, or physically injure juvenile steelhead rearing in the project area. Noise, vibrations, artificial light, and other physical disturbances can harass fish, disrupt or delay normal activities, or cause injury or mortality, especially during sensitive and critical life stages such as migration and spawning periods. For most activities, the effects on fish (including steelhead) would be limited to avoidance behavior in response to movements, noises, vibration, and shadows caused by construction personnel and equipment operating in or adjacent to the channel.

Physical disturbance and injury are most likely to occur during in-channel work associated with demolition of the existing stilling basin, dewatering, and excavation for the new stilling basin foundation, including the potential use of blasting as a demolition method. These effects are described further below.

Dewatering

Dewatering would occur in the area between the base of LCSD and the downstream edge of Pool 1. Prior to construction of the new stilling basin, the existing stilling basin area, Pool 1, and the intervening shallow channel/marsh section would be dewatered through the use of pumps. To minimize the potential for groundwater seepage into the basin, the contractor may also need to extract some groundwater in the immediate vicinity of the stilling basin. Prior to dewatering operations, Pool 1 would be isolated from the creek channel at the downstream end to prevent water from seeping back into the pool. As described in Chapter 3, Project Description, the pumped water would be treated by settling, filtration or other means prior to discharge into San Mateo Creek in compliance with the turbidity discharge limits of the San Francisco Bay Regional Water Quality Control Board (RWQCB). For all dewatering operations, the pump's intake would be fitted with screens meeting CDFG and NMFS criteria to prevent effects on listed species. Qualified and permitted fish biologists would remain on site during the initial dewatering and be available to rescue any fish found in Pool 1 prior to complete dewatering and relocate them to a suitable location within San Mateo Creek downstream of the construction site. Major construction of the proposed dam improvements is expected to take approximately 9 months with some additional minor work, as needed, continuing for 5 months, for a total of 14 months. All major construction activities, including dewatering, are scheduled to occur during the 9-month period between March and November. To the extent feasible, the schedule would restrict construction activities that would affect spillway operations to the dry season—the period between April 14 and November 15. For the purposes of assessing disturbance and direct injury to steelhead from construction activities, it is assumed that instream project activities relating to dewatering (including placement of fill, isolation of stream channel sections, and dewatering discharges to San Mateo Creek) could commence as early as March 1 and could continue through November.

As a general rule or performance measure for protection of fishery resources, work in an active stream channel should be avoided during the times of year salmonids are present, or for resident waters such as San Mateo Creek that support steelhead, during periods that avoid sensitive life stages such as adult migration, spawning, egg incubation, emergence of fry, and juvenile emigration. Adult steelhead may enter creeks as early as late October (Shapovalov and Taft, 1954) however, the majority of CCC steelhead enter rivers later in the season, typically between late December and April (Moyle et al. 2008). CCC steelhead enter rivers in reproductive condition and spawn soon after reaching spawning grounds. Most spawning typically occurs during late spring (Moyle et al. 2008), avoiding damaging effects of winter floods common to the coastal watersheds along California's central coast. This late spawning strategy also permits CCC steelhead to spawn in upper portions of seasonally-flowing watersheds, which are encountered in the southern portion of their range. Development of steelhead eggs is dependent upon water temperature in the gravels (Moyle, 2002), and Shapovalov and Taft (1954) estimated hatch time to be 25 to 35 days, with emergence of fry after 2 to 3 weeks for alevin development. On Waddell Creek, Shapovalov and Taft (1954) observed a bimodal emigration pattern by juveniles with peaks occurring in early January and mid-March (Moyle et al. 2008), although steelhead move downstream during all seasons of the year. Typically, by June 1 spawning, egg incubation, and emergence of fry is complete and steelhead smolts have emigrated out of stream networks (Shapovalov and Taft, 1954).

Because instream construction and dewatering activities could occur as early as March 1, there is a potential for project-related disturbance and direct injury to steelhead during the sensitive life stages of adult migration, spawning, egg incubation, fry emergence, and juvenile emigration. The proposed construction work at the base of LCSD within the creek channel would occur in the extreme upstream extent of lower San Mateo Creek. Therefore, construction activities resulting in the isolation and dewatering of San Mateo Creek between the base of the dam and the downstream edge of Pool 1 would not create a barrier to migrating adults or emigrating juveniles. Additionally, the nearest potential spawning habitat to the proposed construction activities within lower San Mateo Creek is approximately 2,000 feet downstream from the stilling basin work area (Figure 5.13-8). Proposed construction activities at the base of LCSD would not interfere with surface runoff contributions to creek flow, as the project includes provisions to route runoff around the project site. Therefore, construction activities at the base of LCSD are unlikely to adversely affect steelhead migration, spawning, egg incubation, or emergence of fry from spawning gravels within the project area. This would be a *less-than-significant* impact.

However, as described above in the Setting, Pool 1 represents the upstream extent of habitat potentially suitable for steelhead and may provide rearing habitat for juvenile steelhead. Dewatering activities commencing on March 1 could cause steelhead, including emigrating juveniles, to become entrained in the pump or stranded in the dewatered area. However, the proposed project includes the on-site oversight of a qualified biologist during the initial dewatering of Pool 1 and the stream channel between the upstream edge of Pool 1 and the existing stilling basin, who would recover any fish trapped in or near the areas being dewatered and then release the rescued fish downstream of construction area at a suitable location (see Chapter 3, Project Description, Section 3.6.3, Construction Activities at the Toe of the Dam). Fish relocation activities pose a risk of injury or mortality to rearing juvenile salmonids. Any fish-collecting gear has some associated risk to fish, including stress, disease transmission, injury, or death. Lacking specific information on fish density in the project area, it is not possible to quantify the numbers of steelhead that may be affected by the proposed action. The amount of unintentional injury and mortality attributable to fish capture varies widely, depending on the method used, the ambient conditions, and the expertise and experience of the field crew. Sub-yearlings and juveniles may hide in crevices and spaces between boulders and be missed during the attempt to remove and relocate fish, or fish may be harmed from the stress of being handled. Additionally, placement of structures at the downstream edge of Pool 1 could injure or harm steelhead or other aquatic wildlife through crushing, abrasive action, or the stress of increased turbidity and sediment from activity within the stream channel. Fish that elude capture would remain in the project area during construction activities and could be lost to desiccation, thermal stress or crushing by heavy equipment. Although an attempt would be made to move all fish safely from the dewatered portions of the stream, dewatering the work area may result in harm or mortality to steelhead, if present. Therefore, dewatering and instream construction activities, including fish relocation during a high sensitivity life history stage for steelhead, would be a *significant* impact.

Implementation of Mitigation Measure M-BI-12a (Fish Rescue and Relocation) would minimize the potential for injury or mortality to juvenile steelhead through the development and implementation of a fish rescue and relocation plan. Such a plan would be developed by a qualified fisheries biologist and would be submitted to CDFG and NMFS for review and comment. Since fish relocation activities would be conducted by qualified fisheries biologists following both California Department of Fish and Game and NMFS guidelines, direct effects to and mortality of juvenile salmonids during capture would be minimized. Studies indicate that average mortality rates for salmonid relocations conducted using NMFS protocols are below one percent (NMFS, 2006). In addition, surveys indicate that steelhead are abundant and well distributed throughout lower San Mateo Creek and presence of multiple age classes indicates successful reproduction is occurring within the local population (ENTRIX, 2009). Due to the relatively large number of juveniles produced by each spawning pair, steelhead spawning in this watershed in future years are likely to produce enough juveniles to replace the few individuals that may potentially be lost at the project site due to relocation and dewatering. It is unlikely that the low potential for loss of a few individual juveniles would affect the magnitude of future adult returns. With implementation of Measure M-BI-12a the impact would be reduced to a less than significant level.

Additionally, implementation of Mitigation Measures M-BI-1a (Worker Training Program), M-BI-1b (Avoidance and Restoration), M-BI-3b (Exclusion Fence), M-BI-3c (Biological Monitor), and M-BI-3g (General Avoidance Measures) described in Section 5.13.3.6 would reduce impacts on steelhead. Mitigation Measure M-BI-1a (Worker Training Program) would reduce impacts associated with dewatering by training workers on general resources impact avoidance. Mitigation Measure M-BI-1b (Avoidance and Restoration) would require avoidance of riparian habitat where feasible and restoration of temporarily disturbed riparian habitat; this measure also requires the complete removal of temporary fill and restoration of stream channel and riparian habitats not permanently removed by the project following completion of construction. Mitigation Measure M-BI-3b (Exclusion Fence) would require the installation of environmental sensitive area fencing to protect the creek adjacent to the construction areas, and Mitigation Measure M-BI-3c (Biological Monitor) would require a qualified biologist familiar with steelhead to periodically inspect onsite compliance with all mitigation measures. Mitigation Measure M-BI-3g (General Avoidance) would provide general onsite guidance for the SFPUC and its contractors for avoiding impacts to biological resources.

With implementation of the identified mitigation measures, the impacts relating to disturbance and direct injury to steelhead from construction in lower San Mateo Creek would be reduced to a less than significant level.

Excavation and Blasting

The existing stilling basin is proposed to be broken up by use of an excavator with a concrete breaker mounted on its arm; excavation for the new stilling basin would be conducted by typical excavation methods, such as with a rock breaker attached to the excavator arm. However, it is possible that the SFPUC or its contractor could utilize controlled detonations (blasting) during excavation as a last resort method in the event of unforeseen conditions—e.g., if all other methods prove to be insufficient for excavating the types or rock materials encountered or if necessary to meet scheduling requirements. Controlled blasting can be used to remove approximately 3-foot layers of rock or concrete, and would speed up the demolition and/or excavation process if very hard rock or concrete were encountered. Please refer to Chapter 3, Section 3.6.3, for a more detailed description of the proposed blasting technique.

Anthropogenic sound could have no effect on fish, or could result in various behavioral or physiological responses depending on the life stage and species, as well as the intensity and duration of the sound. Behavioral responses could involve fish swimming away, thereby decreasing the potential physiological effect. Behavioral alterations, however, could result in fish leaving a feeding ground or an area associated with reproductive activity, such as spawning habitat. Such behavioral responses that result in longer-term behavioral change could subsequently affect survival and reproduction. Direct physiological effects are also possible for various fish species and life stages, and could include temporary to permanent hearing loss, damage to internal organs, and even mortality for sound sources at certain intensities. To assess potential impacts on steelhead due to underwater sound pressure levels that might be produced during the proposed blasting, various studies on the effects of sound levels on aquatic species are discussed below.

The awareness threshold (or startle response) in fish species, including steelhead, is found to be at about a 120-decibel (dB) sound pressure level (San Luis and Delta-Mendota Water Authority and Hanson, 1996). The awareness thresholds for behavioral avoidance of many species of fish, including Chinook salmon and steelhead trout, are at sound pressure levels of about 160 dB

(San Luis and Delta Mendota Water Authority and Hanson, 1996), as well as sound pressure levels of up to 166 dB at frequencies of 100 hertz (Hanson et al., 2004). These sound pressure thresholds are levels at which the tested fish species have been found to display significant behavioral avoidance. The tests resulting in behavioral avoidance have not resulted in sub-lethal effects or mortality on fish species. Loeffelman et al. (1991; cited in Hanson et al., 2004) determined that a signal of 166 dB results in behavioral avoidance of migrating 7-inch steelhead trout and 3.5-inch Chinook salmon smolts, with 100 percent survival of the fish exposed to the sound signal.

The response of the receptors of the ear and lateral line have been investigated to determine whether high-intensity sounds can damage fish sensory receptors. Enger (1981) found that sounds of 180 dB could destroy ciliary bundles on sensory cells in Atlantic cod. Hastings et al. (1996) found, however, that oscars exposed to 180 dB for one hour showed no detrimental effects. These results suggest that damage from sound might not appear for a considerable time after an acoustic assault or that different species could have different sensitivities. Also, this type of exposure is in contrast to sudden high-intensity sounds (e.g., from pile driving) where fish are unable to avoid sudden sound pressure levels of an intensity (approximately 200 dB or more) that could cause greater physiological damage or mortality. Sound pressure levels from detonation of explosives (229 to 234 dB) can be lethal to fish (Bennet et al., 1994).

A difference of 80 dB between the lethal response threshold (230 dB) and the modified behavior threshold (150 dB) is equivalent to a 10,000-fold decrease in underwater sound pressure level. These data suggest that only intense sounds in the range of 180 to 220 dB are likely to cause damage to the sensory receptors of the ears of fishes, but effects would be dependent on species and site-specific factors. Intense sounds greater than 220 dB are likely to cause significant physiological damage and mortality. Recent SFPUC experience during construction of the New Crystal Springs Bypass Tunnel (NCSBT) suggests that the NMFS biologists consider a performance threshold of 100 kilopascal (kPa) (equivalent to 220 dB) peak sound pressure level and 187 dB sound exposure level (SEL)[21] for underwater sound pressure levels at fish habitats to be sufficient to avoid significant adverse effects on fish.

To assess potential site-specific impacts on steelhead from the proposed blasting, Wilson, Ihrig & Associates conducted an assessment of the potential blasting impacts relating to noise and vibration effects on fish in lower San Mateo Creek (WIA, 2009), which is included as Appendix L to this EIR. The nearest potential steelhead rearing habitat in the vicinity of the proposed blasting site is Pool 2 in San Mateo Creek, approximately 110 feet long and approximately 220 to 330 feet from the stilling basin work area; this assumes blasting would be conducted after the dewatering and complete removal of Pool 1, so that Pool 1 would no longer be potential rearing habitat. The nearest potential steelhead spawning habitat in the vicinity of the proposed blasting site is approximately 2,000 feet from the basin work area (Figure 5.13-8). Because the stilling basin work area would be separated from the spawning habitat by dry ground (i.e., it would not be acoustically coupled to these areas), the underwater sound pressure level would be caused by the transmission of energy from ground vibration (WIA, 2009).

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[21] SEL is a metric that quantifies the sound energy for a given event, normalized to a one-second duration.

As estimated by noise and vibration analyses conducted by WIA (2009), at the nearest distance of 220 feet, the upstream extent of Pool 2, with an explosive charge of 20 pounds per delay, the peak underwater sound pressure level would range from 185 to 205 dB *re* 1 microPascal (1.8 to 17.8 kPa); this would be lower than the NMFS criterion limit of 220 dB. In addition, the duration of the blasting noise and vibration would be typically 2 to 8 seconds, with SEL values likely to range from 157 to 185 dB; this is lower than the NMFS SEL criterion of 187 dB. Therefore, with charge weights up to a maximum of 20 pounds per delay, it is estimated that the underwater sound caused by controlled detonations at the stilling basin site would not exceed the limits established by the NMFS, and would not cause physiological damage, sub-lethal effects, or mortality to steelhead in Pool 2 or cause potential behavioral avoidance of spawning habitat approximately 2,000 feet downstream from the base of LCSD. Furthermore, because vibration from blasting can be affected by local geologic conditions, if charge weights greater than 20 pounds were used, there is a potential that this criteria could still be met depending on site specific conditions.

Therefore, if blasting were used for demolition and excavation of the stilling basin, with charge weights up to a maximum of 20 pounds per delay, this impact would be less than significant. However, if demolition charges greater than 20 pounds per delay were used, vibration and underwater sound levels could exceed the criteria established by the NMFS and cause potential physiological damage to fish depending on site specific geologic conditions; this would be a *potentially significant* impact. Implementation of Mitigation Measure M-BI-12b (Vibration Monitoring) would require that vibration monitoring be conducted during blasting work if charges greater than 20 pounds per delay were used for demolition and excavation of the stilling basin. The vibration monitoring data would be used to verify and validate the local geologic conditions relating to blasting-related vibration and to ensure that the NMFS criterion limit of 100kPa (220 dB) peak sound pressure level and 187 dB SEL for underwater sound pressure levels were not exceeded at Pool 2. With implementation of the identified mitigation measure, the impact would be reduced to less than significant.

Impact BI-13: Loss of riparian vegetation, shaded riverine aquatic cover, and aquatic habitat area.

Impact BI-1 in Section 5.13.3 above provides a detailed assessment of the impacts associated with the removal of riparian vegetation in the construction area. This impact describes the impacts specific to steelhead in lower San Mateo Creek associated with the loss of riparian vegetation, shaded riverine aquatic cover, and aquatic habitat due to the proposed project. Riparian vegetation directly influences the quality of fish habitat, affecting cover, food, instream habitat complexity, streambank stability, and temperature regulation by shading water from direct sunlight. Large instream woody material usually originates from riparian trees and provides cover and habitat complexity in aquatic environments, an essential component of fish habitat. The roots of riparian vegetation at the land-water interface provide streambank stability and cover for rearing fish. Low-hanging branches are used by fish for escape cover from avian and terrestrial predators. The proposed project would require the temporary and/or permanent removal of riparian vegetation adjacent to the stream channel between the existing stilling basin and the upstream edge of Pool 2.

As discussed in Impact BI-1, riparian vegetation that is removed during construction and replaced by a project feature (e.g., new stilling basin) is considered to be permanently removed because the project feature precludes restoring the vegetation at its original location. Temporarily affected riparian vegetation applies to vegetation removed as part of site-clearing activities for construction access (e.g., construction of the temporary access road) but proposed to be replaced and restored following completion of construction. Impacts on steelhead related to the loss of riparian vegetation and aquatic habitat are as follows:

Riparian vegetation adjacent to the stream channel upstream and downstream of Pool 1: The channel conditions between the existing stilling basin and Pool 1 are unsuitable for salmonids. Two poorly defined channels, 1 to 2 feet wide and up to 4 inches maximum depth, exist between the stilling basin and Pool 1. These channel beds are composed of mud and vegetated with emergent and riparian vegetation. The channel between Pool 1 and Pool 2 is slightly better defined, somewhat wider, and mostly composed of mud. This channel contains a dense growth of emergent vegetation; however, based on surveys conducted in August 2008 (ENTRIX, 2009), it is considered unsuitable for supporting salmonids. At the flows observed during late summer surveys in 2008, the creek channel areas both upstream and downstream of Pool 1 were determined not to provide habitat suitable for supporting juvenile steelhead rearing. Stream channels of this type generally do not support migration, rearing, or spawning habitat for steelhead; thus, the loss of riparian vegetation and shaded aquatic cover in this area would be unlikely to affect steelhead habitat due to the existing poor quality of riverine habitat in these sections of San Mateo Creek. Therefore, removal of riparian vegetation in this area would be a *less than significant* impact on steelhead habitat.

Riparian vegetation surrounding Pool 1: Pool 1 is sustained by seepage and leakage and could provide some habitat to support steelhead rearing, although only carp and mosquito fish have been observed in Pool 1 during aquatic habitat surveys (ENTRIX, 2009). Pool 1 is bordered by riparian vegetation providing shaded riverine aquatic cover. However, under the proposed project, Pool 1 and the associated riparian vegetation surrounding Pool 1 would be permanently removed. The permanent loss of riparian vegetation and shaded riverine aquatic cover represents a permanent removal of aquatic habitat, as well as subsequently reduced habitat function (e.g., bank stability, habitat complexity, avian predator cover, temperature regulation from shading). Therefore, removal of riparian vegetation surrounding Pool 1 would be a *significant* impact on steelhead habitat.

Aquatic habitat in Pool 1: Construction of the proposed project would result in the temporary and permanent loss of aquatic habitat area, including the permanent loss of potential rearing habitat for juvenile steelhead at Pool 1. Construction of the new stilling basin and placement of the rock riprap at the downstream end of the proposed stilling basin for erosion control would result in the permanent loss of Pool 1, which includes approximately 609 square feet of potential rearing habitat for juvenile steelhead. Pool 1 is a scour hole created by previous releases from the 60-inch emergency release valve. Pool 1 represents only marginal steelhead habitat with limited rearing habitat function and is the extreme upstream extent of habitat potentially suitable for steelhead (ENTRIX, 2009). The lower San Mateo Creek stream channel upstream of Pool 2 is characterized as unsuitable for all salmonid life stages. Loss of Pool 1 would be a *significant* impact.

Implementation of Mitigation Measure M-BI-13 (Enhancement of Existing Fisheries Habitat) would compensate for the permanent losses of riparian vegetation, shaded riverine aquatic cover, and aquatic habitat through enhancement of existing aquatic habitat at Pool 2. Pool 2 is currently limited as functional steelhead rearing habitat due to a lack of riparian vegetation and shaded riverine aquatic cover. Measure M-BI-13 would require the provision of riparian vegetation and shaded riverine aquatic cover on the banks of Pool 2 as well as the removal of concrete blocks currently situated within Pool 2. Because the habitat available in the creek immediately upstream of Pool 2 is of poor quality and represents marginal and fragmented habitat, enhancement of Pool 2, which contains potentially higher quality adjacent habitat, could result in a net benefit overall to steelhead. With the implementation of the identified mitigation measure, the impact would be reduced to less than significant.

Impact BI-14: Reduction in streamflows downstream of construction area.

Under existing conditions, dry weather flow in the creek immediately downstream of the stilling basin is about 0.7 cfs, consisting mainly of leakage from pipes and seepage around and under the dam from subsurface flows. During the construction period, there could be a slight decrease in leakage, due to the lowered reservoir level; at the same time, however, there could be a slight increase in subsurface seepage flows during dewatering operations (refer to Section 5.15, Impact HY-1 for more detailed discussion on construction-related impacts on streamflows). In addition, water pumped during dewatering would be treated by settling, filtration or other means and shown to meet all applicable requirements prior to discharge to San Mateo Creek downstream of the construction area. Therefore, the effect of project construction on lower San Mateo Creek's dry-season flow regime would be negligible.

Following construction of the proposed project, the SFPUC would resume its current operations with regard to releases to San Mateo Creek and would maintain the existing baseline flows in San Mateo Creek. This would avoid any potential changes in long-term streamflows that could affect steelhead habitat in stream reaches downstream of the LCSD construction site. Therefore, this impact would be *less than significant* and no mitigation is required.

5.13.7.5 Operational Impacts

Section 5.13.3.5 presents a detailed analysis of potential operational impacts on terrestrial and wetlands biological resources, and Tables 5.13-4 and 5.13-5 provide an overview of those impacts. Upstream of LCSD, operational impacts on fisheries resources would occur due to the changes in types and amount of habitat that would result from the higher reservoir operating levels under the proposed operations. The primary factors influencing operational fisheries impacts upstream of the reservoir are related to the changes in the fluctuation/inundation zones and the open water and riverine habitats. The proposed project operations downstream of LCSD would be a continuation of the current operations (described above in Impact BI-15), and no changes would be expected in the long-term flows and fisheries resources in lower San Mateo Creek.

Impact BI-15: Inundation of approximately 1,500 linear feet of riverine habitat.

As described in Chapter 3, Project Description, Section 3.7, under the proposed project, the maximum normal water surface elevation in Crystal Springs Reservoir would be increased to elevation 287.8 feet, which is 4 feet higher than the current normal maximum elevation of 283.8 feet. In keeping with its current practice, the SFPUC would allow the reservoir level to occasionally exceed the maximum normal water surface elevation. Water surface elevations would exceed 287.8 feet for short durations (up to 14 days) and could rise up to 291.8 feet during the rainy season (November through April). Exceedances could occur any time during the rainy season, but would primarily occur after March 1 when the SFPUC begins eliminating the winter flood reservation as the rainy season ends. General operation of Crystal Springs Reservoir would be similar to current operations in that the SFPUC would attempt to keep the reservoir as full as possible without exceeding the maximum normal operating level, to avoid uncontrolled spills (i.e., water over the spillway), and to minimize releases to San Mateo Creek (i.e., controlled spill through the release valves below the dam).

Potential operational effects of the proposed project would occur upstream of the reservoir where operations would increase water levels along tributary streams, altering habitat in the inundated channels. An increase of the reservoir's maximum storage elevation would lead to the seasonal inundation of sections of upper San Mateo and Laguna Creeks, thus converting portions of existing creek channels into open water/lacustrine habitat. Consequently, rainbow trout spawning habitat could be lost to inundation during the trout spawning season (approximately February to April) due to operation of Crystal Springs Reservoir at higher water surface elevations.

Summary of Programmatic Analysis in WSIP PEIR

A programmatic-level impact assessment relating to increased water elevations in Crystal Springs Reservoir was conducted for fisheries resources as part of the SFPUC's Water System Improvement Program PEIR (San Francisco Planning Department, 2008). This impact assessment evaluated the effects on fisheries resources within Crystal Springs Reservoir as well as along Laguna and upper San Mateo Creeks upstream of the reservoir. The analysis of fisheries resources in the reservoir concluded that increased reservoir storage would increase the volume of habitat available for resident fish species inhabiting the reservoir, including both warmwater and coldwater fish species. In addition, the increase in storage elevation could also provide greater opportunities for connectivity and migration of fish between the reservoir and upstream tributary habitat. As a result of these factors, the PEIR concluded that increased reservoir storage could provide a beneficial impact on fisheries resources, excluding spawning habitat, for upper San Mateo Creek and the Laguna Creek system.

In assessing impacts on fisheries resources in Laguna and upper San Mateo Creeks, the PEIR provided a generalized program-level analysis prior to site-specific surveys. In the absence of site-specific data, the program-level analyses conservatively assumed that all reaches of these creeks that would be potentially inundated under the proposed operations consist of sensitive spawning habitat; this represents a maximum worst-case scenario since it characterizes the maximum potential impact on the trout spawning habitat and resident trout population. Under this scenario, it was estimated that 750 linear feet would be inundated in Laguna and upper San Mateo Creeks, for a total of 1,500 linear feet, and that these reaches consist entirely of spawning habitat. Due to this predicted loss of spawning habitat and the absence of data on additional spawning habitat in upstream areas, the PEIR concluded that this impact was potentially significant and unavoidable based on conservative, worst-case assumptions. To mitigate this impact on spawning habitat loses, the PEIR proposed the creation of new spawning habitat at higher elevations above the proposed operating levels of Crystal Springs Reservoir, if feasible, to reduce this impact to less than significant.

Because of the programmatic nature of the impact analysis, the PEIR stated that upstream areas could provide suitable replacement habitat to support the trout population, and that this would be evaluated at the project-level CEQA review for the LCSDI project. Additionally, it was stated that the project-level CEQA review for the LCSDI project would further evaluate the severity of this impact and the feasibility and efficacy of the proposed mitigation measure. Therefore, consistent with the recommendations of the PEIR, this EIR evaluates the project-level impacts on fisheries resources from operation of the proposed project using the results of now available site-specific habitat surveys and assesses the feasibility and efficacy of proposed programmatic measures. As described below, the project-level fisheries analysis modifies certain PEIR impact determinations based upon more detailed site-specific data and analysis. Project-level conclusions supersede any contrary impact conclusions in the PEIR.

Project-level Analysis

ENTRIX conducted fish habitat surveys and assessments on Laguna and upper San Mateo Creeks in 2007 to document the presence, extent, and quality of potential spawning habitat (in linear feet of channel and in square feet of total available area) and to identify the location of the channel segments that support potential spawning habitat (ENTRIX, 2009). For the Laguna Creek system, ENTRIX assessed the general channel conditions for potential spawning habitat and mapped the location of channel segments that could provide potential spawning habitat. The qualitative approach used to assess habitat within the Laguna Creek system was applied because Laguna Creek does not support year-round rearing habitat (discussed in Section 5.13.5, above). In upper San Mateo Creek, the habitat survey mapped and quantified potential spawning habitat to evaluate the loss of spawning habitat within the potential future inundation/fluctuation zone relative to existing spawning habitat in San Mateo Creek. It should be noted, however, that surveys in upper San Mateo Creek were conducted during the seasonal low flow period. During this period, it was not possible to fully evaluate the value of potential spawning gravels and so a conservative assessment methodology was undertaken that mapped and quantified all spawning gravels that were of a suitable size, but not necessarily suitable in the context of habitat function given local geomorphology. The result is a conservative assessment of potential spawning habitat within the lower reaches of the area surveyed within the potential future inundation zone. The change in inundation/fluctuation zone was also assessed with regard to migration conditions for trout fry from their rearing habitat in the creek to the reservoir that occurs in the spring in order to assess the overall impact of future operations on the resident trout population.

Laguna Creek

ENTRIX surveyed the Laguna Creek system to identify locations of potential spawning substrate in the watershed and to assess the area for early fry rearing habitat that could persist through spring in normal or wetter years (ENTRIX, 2009).

Spawning Habitat. The Laguna Creek system contains no spawning habitat within the existing fluctuation zone or within the reach that would be affected by the proposed increase in reservoir operating levels. The channel bed within this reach is composed of sand with some areas of hardpan clay, and is unsuitable for supporting salmonid spawning. Spawning habitat is located further upstream in Laguna Creek and on the tributaries of Spring and Fault Creeks. The existing spawning habitat within the Laguna Creek system is upstream of the maximum potential water surface elevation of 291.8 feet. Operating the reservoir to 287.8 feet under the proposed project (with occasional temporary exceedances up to 291.8 feet) is unlikely to affect trout spawning habitat within the Laguna Creek system for rainbow trout in Upper Crystal Springs Reservoir; therefore, this impact would be *less than significant.*

Migration. Early fry rearing could occur within all the channel segments within the potential future inundation zone provided there is sufficient late spring or early summer flows. Fry that rear in these reaches of the Laguna Creek system, or farther upstream, would have to migrate to the reservoir before surface flows were disconnected from the reservoir. Outmigration conditions in the Laguna Creek system most likely vary dramatically depending on the water year type. Because of the intermittent nature of these streams, rainbow trout fry must reach the reservoir in order to survive. Operating the reservoir at the proposed maximum normal elevation of 287.8 feet by February of each year (with occasional temporary exceedances up to 291.8 feet) and maintaining that level until early July would improve outmigration conditions in Laguna Creek by keeping more of the lower Laguna Creek channel wetted to facilitate fry movement into the reservoir. These operations would likely be a *beneficial* impact on fisheries by improving outmigration conditions from Laguna Creek to Upper Crystal Springs Reservoir.

Rearing Habitat. Laguna Creek supports no year-round rearing habitat within the potential future inundation zone or the other reaches that are accessible to rainbow trout from Upper Crystal Springs Reservoir under existing conditions. Operating the reservoir at the proposed maximum normal elevation of 287.8 feet by February of each year (with occasional temporary exceedances up to 291.8 feet) under the proposed project would not affect trout rearing habitat within the Laguna Creek system for rainbow trout in Upper Crystal Springs Reservoir; therefore, this impact would be *less than significant.*

Summary. The Laguna Creek system contains no spawning habitat within the existing fluctuation zone or within the reach that would be affected by the proposed increase in reservoir operating levels; therefore, the impact on spawning habitat would be less than significant. Operating the reservoir at the proposed maximum normal elevation of 287.8 feet by February of each year (with occasional temporary exceedances up to 291.8 feet) under the proposed project would not affect trout rearing habitat within the Laguna Creek system for rainbow trout in Upper Crystal Springs Reservoir; therefore, the impact on rearing habitat would be less than significant. Additionally, raising reservoir water surface elevations under the proposed project could improve outmigration conditions in Laguna Creek for fry by keeping more of the lower Laguna Creek channel wetted to facilitate movement into the reservoir, likely resulting in a beneficial impact on migration conditions for fisheries. Overall, impacts of proposed operations on fisheries resources in the Laguna Creek system would be *less than significant.*

Upper San Mateo Creek

Habitat within upper San Mateo Creek supports seasonal migration, spawning, incubation, and rearing of rainbow trout from Crystal Springs Reservoir. No change to operations or diversions from Upper San Mateo Creek are proposed at the mud dams and flows would not be altered downstream of these dams. Under existing operating conditions, when the reservoir is held at an elevation of 283.8 feet, approximately 682 linear feet of upper San Mateo Creek channel is available for rainbow trout within the zone that would be inundated under the proposed maximum normal reservoir level of 287.8 feet. Habitat in this inundation reach represents multiple habitat units and includes five pools, two riffles, and three runs. Approximately 830 square feet of potential spawning habitat is included within this inundation reach, and three redds were observed during surveys in this reach in 2007.

Under the proposed project, with the reservoir held at an elevation of 287.8 feet elevation, all of this habitat would be partially or completely inundated and converted to reservoir habitat. When reservoir water surface elevations exceeded 287.8 feet for short durations (up to 14 days) up to the maximum potential elevation of 291.8 feet during the rainy season (November through April), up to an additional 409 linear feet of upper San Mateo Creek would be temporarily inundated. Habitat in this 409-linear-foot stretch represents multiple habitat units and includes an additional one pool, one riffle, and two runs supporting approximately 400 square feet of potential spawning habitat. One additional redd was observed in this reach during the 2007 survey (ENTRIX, 2009).

To evaluate the potential impact on the resident rainbow trout population in Crystal Spring Reservoir from inundation of these habitat types, ENTRIX (2009) conducted a habitat survey along a total channel length of 6,897 feet on upper San Mateo Creek within the potential future inundation reach and the canyon reach, upstream of the potential future inundation reach, to evaluate potential rainbow trout habitat quality and quantity. The total length of riffle and pool habitat was about equal within the surveyed extent of upper San Mateo Creek, accounting for 36.3 percent and 34.9 percent of the total length of the channel surveyed, respectively. Run habitat was more abundant in the lower gradient potential future inundation reach, while riffle (and therefore spawning) habitat was more abundant, not simply in terms of suitable substrate size but also in terms of habitat function (Taylor, Pers. Comm.), in the steeper gradient reach upstream of the potential future inundation reach in the canyon reach. A total of 70 pool habitats, 32 run habitats, and 54 riffle habitats were surveyed in upper San Mateo Creek (ENTRIX, 2009).

Spawning Habitat. The canyon reach stretches 5,806 feet from the top of the potential future inundation reach to the road downstream of Mud Dam No. 2 (see Figure 5.13-6). Approximately 46 percent of the canyon reach was classified as riffle habitat, with 34 percent pools, and 20 percent run habitat by length. A total of 54 pools, 46 riffles, and 22 runs were classified during the habitat survey. Thirty potential spawning areas (ranging from 5 to 300 square feet) were located in the canyon reach, for a total area of 1,220 square feet. A total of 10 suspected redds at six sites were identified, along with 26 other potential spawning sites. Redds were identified at approximately a quarter of the potential spawning sites surveyed in the canyon reach (ENTRIX, 2009). No part of the canyon reach would be affected by the proposed project, and all existing spawning habitat in this part of the creek would remain available under future with-project conditions.

Under the proposed project, the potential maximum inundation under short-term exceedances could occur during the spawning period for rainbow trout. The proposed reservoir operating levels could inundate spawning gravels within the entire length of the reach from elevations 283.8 to 291.8 feet during periods sensitive to the species. To conservatively characterize and assess potential inundation impacts on the resident trout population, the worst-case scenario (inundation up to 291.8 feet) is assessed here.

Under the proposed project, short-term exceedances, estimated to last up to 14 days during the rainy season and occurring about one year in three between November and April, would result in all potential spawning gravels in the 1,091-linear-foot reach surveyed to be converted to open water/lacustrine habitat (under the worst-case scenario with the reservoir at an elevation of 291.8 feet). The proposed increase in water surface elevation could inundate (under the worst-case scenario) up to six pools, five runs, three riffles, 1,230 square feet of potential spawning area (ranging from 10 to 300 square feet), and four of the redd sites observed during the August 2007 survey (one other redd site is subject to inundation under existing conditions). Approximately 57 percent of the length of this 1,091-linear-foot reach was classified as run habitat. Pool habitat comprised about 34 percent, and riffle habitat was 9 percent by length. Not all of the potential spawning areas contained redds. However, under typical operating conditions of the proposed project, with maximum normal reservoir water surface elevation at 287.8 feet, an additional 409 linear feet of San Mateo Creek channel would be available to resident trout in upper San Mateo Creek between the 287.8- and 291.8-foot elevations. Habitat in this 409-linear-foot reach, with water surface levels at 287.8 feet, would include one pool, one riffle, and two runs, and would include approximately 400 square feet of potential spawning habitat (and one of the redds identified in 2007) (ENTRIX, 2009).

The site-specific surveys conducted on upper San Mateo Creek also quantified the availability of habitat and surveyed the quality of habitat available to the resident trout population at elevations higher than 291.8 feet in the area referred to as the canyon reach. The results of these surveys, described in detail in Section 5.13.5, determined that the canyon reach contains sufficient habitat to sustain migration, spawning, incubation, and rearing in the 5,806 feet upstream of the proposed maximum operating water level. The habitat survey conducted by ENTRIX (2009) documented at least 26 potential spawning sites totaling over 1,220 square feet in the canyon reach, upstream of the potential future inundation reach. Ten redds were found at six locations in the canyon reach, indicating that about 20 more sites are potentially available for spawning that have greater potential habitat function then those sites surveyed in the lower reaches (Taylor, Pers. Comm.).

These results indicate that, due to the majority of high quality, functional spawning habitat being located upstream of the future inundation reach, inundation of spawning habitat within the future inundation reach is unlikely to have an adverse effect on resident trout population reproduction. Additionally, salmonid spawning locations can vary greatly by water year type as different instream flows can result in varying suitability of potential spawning substrate to provide a suitable location for egg incubation. It is likely that under future operations, resident trout would migrate further upstream to spawn (Taylor, Pers. Comm). Thus, the loss of spawning habitat for rainbow trout from Crystal Springs Reservoir in upper San Mateo Creek within the future inundation reach due to the proposed operations would not be a significant reduction in functional spawning habitat, and the magnitude of the predicted loss would not represent a substantial adverse effect on the resident trout population in Crystal Springs Reservoir (ENTRIX, 2009). In addition, as discussed below, under current conditions, a lack of hydraulic connection to the reservoir currently results in high rates of mortality for emerged fry emigrating to the reservoir and rearing juveniles in the future inundation reach. This indicates that the limiting factor on the resident trout population is fry and juvenile survival in the lower reaches of upper San Mateo Creek, not availability of functional spawning habitat. Therefore, the impact of the proposed reservoir operating levels on spawning habitat in upper San Mateo Creek would be *less than significant* and maintaining higher water levels until July would likely benefit the resident trout population overall.

Migration. Typically, trout fry and juveniles disperse into new habitats when driven by overcrowding as young fish hatch out of redds and enter the stream. In upper San Mateo Creek during May 2007, thousands of fry were observed in the potential future inundation reach, presumably emigrating to the reservoir. At the time of the survey, approximately 300 to 400 feet of channel was dry in the vicinity of the most downstream redd at a location where the channel passes through a large deposit of gravel and cobble. The creek had recently lost surface flow throughout much of this reach, and only a few isolated pools held water. Fry and juvenile trout were trapped in the pools and were dead or dying in the riffles and runs (ENTRIX, 2009). Under the proposed project, operating the reservoir at higher levels by February of each year and maintaining higher level until early July would eliminate the stranding of fry, such as that observed in May 2007, because the gravel bar where surface water disconnected within the channel could be submerged under as much as 1 foot of water (ENTRIX, 2009). This would maintain the connection between upper San Mateo Creek and Crystal Springs Reservoir. Higher reservoir levels under the proposed project would likely represent a *beneficial* impact compared to existing conditions by improving outmigration conditions for fry and juveniles from upper San Mateo Creek to Crystal Springs Reservoir.

Rearing Habitat. Rearing habitat quality for juvenile rainbow trout in the potential future inundation reach is limited. Pools are generally shallow and exposed, and the majority of surveyed habitat is run habitat. Early life stage rearing currently occurs in the potential future inundation reach on a limited basis for emerging fry; however, because flow in this reach is seasonal, it currently provides no rearing habitat for juvenile rainbow trout during summer and fall. Therefore, the impact on rearing habitat for rainbow trout from Crystal Springs Reservoir due to the proposed project would be *less than significant*.

Summary. In upper San Mateo Creek, the proposed reservoir operating levels would partially to completely inundate spawning gravels within the entire length of the reach from elevations 283.8 to 287.8 feet during periods sensitive to the species, and occasionally could inundate spawning gravels up to elevation 291.8 feet. However, surveys conducted upstream of the area that would be inundated show that spawning habitat is not a limiting factor for the resident trout population; additional unutilized suitable spawning habitat is available upstream (ENTRIX, 2009). Therefore, the impact on spawning habitat would be less than significant. Under certain water year types, seasonal intermittent flow in the potential future inundation reach currently results in the stranding of fry and juveniles emigrating to the reservoir in exposed pools, and it has been observed to result in the mortality of trapped juveniles and fry stranded in dewatered run and riffle habitat. Inundation of upper San Mateo Creek between elevations of 283.3 and 287.8 feet (up to 291.8 for temporary exceedances) would likely represent a benefit of the project by improving outmigration conditions for fry and juvenile rainbow trout from Upper San Mateo Creek to Crystal Springs Reservoir. Additionally, because flow in the potential future inundation reach is currently seasonal, it provides no rearing habitat for juvenile rainbow trout during summer and fall, and the impact on rearing habitat would be less than significant. Overall, the impact on fisheries resources and fish populations resulting from increased reservoir operating levels and the associated conversion of riverine habitat to lacustrine habitat (including the loss of some existing spawning habitat) in upper San Mateo Creek would be *less than significant*.

Crystal Springs Reservoir

Project operations would increase the average storage within the reservoir, which offers the potential for increased coldwater pool volume within the reservoir hypolimnion. In addition, increased average reservoir storage would increase the volume of habitat available for resident fish species inhabiting the reservoir, including both warmwater and coldwater fish species. The increase in reservoir water level elevation under the project would also provide greater opportunities for connectivity and migration of fish between the reservoir and upstream tributary habitat. The impact on fish populations within Crystal Springs Reservoir resulting from proposed operations would therefore be *less than significant*.

Summary of Project-level Analysis

In summary, the proposed long term increase in reservoir operating levels would result in *less-than-significant* impacts on fisheries resources in the Laguna Creek system, in upper San Mateo Creek, and in Crystal Springs Reservoir; no mitigation would be required. This project-level analysis, based on site-specific fish habitat surveys conducted subsequent to the PEIR analysis, replaces the previous programmatic analysis provided in the PEIR. Therefore, the programmatic impact analysis on habitat conditions in Laguna and upper San Mateo Creeks in the PEIR, which previously concluded this to be potentially significant and unavoidable impact, is no longer valid, and no mitigation is required. The project-level analysis of fisheries resources in Crystal Springs Reservoir is consistent with and corroborates the programmatic analysis and conclusion previously presented in the PEIR.

5.13.7.6 Mitigation Measures – Fisheries Resources

The following presents the mitigation measures specifically developed to reduce significant and potentially significant impacts on fisheries resources resulting from construction of the proposed project. Additional mitigation measures required to reduce identified impacts on fisheries resources to less than significant are presented in Section 5.13.3.6, Mitigation Measures M-BI-1a (Worker Training Program), M-BI-1b (Avoidance and Restoration), M-BI-3b (Exclusion Fence), and M-BI-3c (Biological Monitor), as well as in Section 5.15.3.6, Mitigation Measure M-HY-3 (Preparation of a SWPPP). No significant impacts were identified for project operation; therefore, no mitigation measures for project operation are identified.

Mitigation Measure M-BI-12a: Fish Rescue and Relocation.

The SFPUC shall implement the following measure in conjunction with Mitigation Measures M-BI-1a (Worker Training Program), M-BI-1b (Avoidance and Restoration), M-BI-3b (Exclusion Fence), M-BI-3c (Biological Monitor), M-BI-3g (General Avoidance), and M-HY-3 (Preparation of a SWPPP) to avoid direct impacts on steelhead and to minimize the potential for injury or mortality from construction activities within lower San Mateo Creek related to instream activities, dewatering operations, and fish rescue and relocation efforts.

Prior to commencing dewatering activities in lower San Mateo Creek (including the stilling basin vicinity, Pool 1, and the intervening shallow channel), the SFPUC shall develop a fish rescue and relocation plan in consultation with a qualified fisheries biologist, CDFG, and NMFS. The plan shall include stipulations that a qualified fisheries biologist with a current CDFG scientific collections permit conducts the fish rescue and relocation effort to rescue and relocate fish from areas isolated for dewatering. The fish rescue effort shall be implemented during dewatering of the instream construction area. At a minimum, the fish rescue and relocation plan shall include the following measures:

- Installation and removal of all temporary dewatering equipment will be conducted under the guidance and supervision of a qualified biologist with a current CDFG scientific collection permit to avoid injuring or killing aquatic species within the work area.

- Prior to dewatering the instream construction zone, a qualified biologist will use NMFS-approved methods to rescue and relocate aquatic species to suitable habitat downstream of the construction zone.

- Fish collected during the rescue operation will be transported to insulated coolers with sufficient aeration systems to maintain suitable water quality conditions. A sufficient number of coolers will be available to separate species and age classes as appropriate to avoid predation.

- Rescued fish will be relocated downstream to suitable equivalent pool habitat, and multiple potential release locations will be identified in order to avoid increased predation potential or overcrowding at a single site.

- Initial dewatering will be conducted under the supervision of a qualified biologist to reduce potential injury or mortality to juvenile steelhead and other aquatic species from stranding.

- Dewatering intakes will be screened with mesh in accordance with NMFS fish screening criteria for anadromous salmonids as outlined in the NMFS's Water-Drafting Guidelines (NMFS, 2001).

- Captured fish will be identified and counted. A technical memorandum documenting rescue operations, species observed, numbers of each species (including the number of any dead or injured juvenile steelhead), and the location of their release will be prepared and submitted to the CDFG and NMFS following rescue operations.

Mitigation Measure M-BI-12b: Vibration Monitoring.

In the event that blasting is used for demolition and excavation in the stilling basin and that blasting techniques using charges greater than 20 pound per delay are required, the SFPUC and/or its contractor shall conduct vibration monitoring during blasting activities to verify and validate the local geologic conditions relating to blasting-related vibration and to adjust the blasting technique appropriately (charge strength per delay) to ensure that the NMFS criterion limit of 100 kPa (220 dB) peak sound pressure level and 187 dB SEL for underwater sound pressure levels are not exceeded at Pool 2. This measure will avoid direct impacts on steelhead and minimize the potential for injury or mortality from construction activities relating to use of blasting during excavation.

Mitigation Measure M-BI-13: Enhancement of Existing Fisheries Habitat.

The SFPUC shall compensate for permanent losses of rearing habitat for CCC steelhead through enhancement of existing suitable aquatic habitat near Pool 2 by implementing at a minimum the measures described below. Currently, approximately 100 linear feet of the south bank of Pool 2 consists of riprap for erosion control. The borders of Pool 2 are currently devoid of riparian vegetation and Pool 2 is unshaded and lacks cover. To enhance the quality of rearing habitat in Pool 2, SFPUC shall vegetate the existing riprap using techniques identified by a revegetation specialist. Source material will consist of locally native riparian vegetative species. These improvements will compensate for the lost habitat values resulting from the permanent removal of Pool 1 and the associated loss of riparian vegetation and shaded riverine aquatic cover. Minimum success and monitoring criteria for this enhancement site shall contain, at a minimum, the following restoration objectives:

- *Removal of concrete blocks in Pool 2*. Pool 2 contains two concrete blocks measuring 5 feet wide by 13 feet long, and 4 feet wide by 6 feet long. The SFPUC shall remove these concrete blocks to increase the area of open-water habitat in Pool 2.

- *Enhance Aquatic Habitat*. Instream cover (e.g., large woody material) shall be added to Pool 2 and additional riparian plantings shall be placed along existing unvegetated natural bank areas of the pool (see next bullet).

- Enhance Riparian Vegetation by Pool 2. The SFPUC shall provide shaded riverine aquatic cover[22] to the creek along Pool 2 to improve the quality of the pool for rearing juvenile steelhead. The SFPUC shall develop a revegetation plan, which will include specific monitoring and performance criteria to ensure successful establishment of the habitat described here within 3 years of completion of construction. At a minimum, the revegetation plan will contain the following performance criteria:
  - Riparian vegetation plantings should be established within 15 feet (horizontal distance) of the water's edge.
  - Vegetation should be planted with the goal of being sufficiently dense at maturity to provide overhead canopy along at least 85 percent of the streambank's length.
  - The species composition will be comparable to undisturbed riparian vegetation along lower San Mateo Creek.
  - The revegetation plan will specify both overstory and understory plantings to maximize shading and bank stabilization. These plantings will be species known to occur along the San Mateo Creek riparian corridor.
  - Plantings will be protected from herbivory by collars and screens, as appropriate, and weed matting will be placed around each planting and anchored in.
  - Planting will take place during early winter (December–February). After planting is completed, a planting layout will be prepared showing the location and species of each planting.
  - Depth to water table will be measured periodically by the use of pipe wells consisting of perforated drain pipe. Such monitoring will determine the need for supplemental irrigation.
  - Performance standards will include 90 percent survival of plantings at the end of the first year, and 75 percent survival of plantings at the end of the second year.

As described in Section 5.13.3.7, in order to avoid additional impacts on biological resources associated with implementation of the above measure, biological mitigation measures shall apply to this measure to prevent or otherwise minimize impacts of habitat enhancement activities on surrounding biological resources. All relevant biological mitigation measures identified in Section 5.13.3.6 apply to this mitigation measure, including Mitigation Measures M-BI-1a (Worker Training Program), M-BI-1b (Avoidance and Restoration), M-BI-3b (Exclusion Fence), M-BI-3c (Biological Monitor), M-BI-3d, 3e, 3f (Preconstruction Surveys), and M-BI-3g (General Avoidance).

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[22] Shaded riparian aquatic (SRA) cover is defined by the USFWS as the unique nearshore aquatic cover occurring at the interface between a river and adjacent riparian habitat. SRA cover provides fish, including steelhead, with protection from predators, maintains shade necessary to reduce thermal input to the creek, and provides nutrients to the creek in the form of fallen leaves and insects. Riparian vegetation is also important in controlling streambank erosion, contributing to instream structural diversity, and filtering surface runoff. Because of the unique biological attributes of SRA cover, the USFWS recommends that project proponents actively seek impact avoidance and mitigation that result in no net loss of existing SRA cover habitat value.

5.13.7.7 Cumulative Impacts

Impact C2-BI: Cumulative impacts on fisheries.

The geographic scope of potential fisheries resources impacts encompasses the jurisdictional waters and riparian habitat within the study area on lower San Mateo Creek and within Crystal Springs Reservoir. Section 5.13, Biological Resources, evaluates the impacts of the LCSDI project on biological resources, including fisheries resources and aquatic habitat. Cumulative impacts on sensitive biological resources, such as steelhead, could occur when the construction impacts of the proposed project are considered in combination with the construction impacts of other projects in the vicinity (listed and described in Section 5.1). The potential exists for cumulative impacts on fisheries resources related to the amount of activity in the area around the Crystal Springs Pump Station and at the base of the LCSD. In addition to the proposed project, two other SFPUC projects—Crystal Springs Pipeline No. 2 Replacement (CSPL2) and Crystal Springs/ San Andreas Transmission Upgrade (CSSA)—would involve construction within the lower San Mateo Creek stream channel downstream of the LCSDI project between 2010 and 2013. Also considered here is the work proposed by San Mateo County to demolish the Skyline Boulevard Bridge and replace it with a new, seismically and structurally sound bridge. Whether the activity occurs simultaneously or consecutively would not affect the totality of the cumulative disturbance to fisheries resources.

For all of the proposed projects with potential for construction impacts within lower San Mateo Creek downstream of the LCSD, compliance with applicable state and federal regulations, EIR mitigation measures, and project-specific permitting requirements would mitigate these cumulative construction impacts through protecting water quality, maintaining beneficial uses designated for San Mateo Creek, and implementing measures to avoid and minimize impacts on steelhead. In particular, the CSSA project would involve construction activities within the lower San Mateo Creek stream channel in the vicinity of Pool 2, immediately downstream of the LCSDI construction area, during the same general timeframe as the proposed project. However, instream construction for the CSSA project would be restricted to the summer low flow period, when sensitive steelhead life stages are absent in San Mateo Creek. In addition, the CSPL2 project would involve construction activities within the lower San Mateo Creek stream channel at two locations in order to remove and/or retrofit pipeline pier supports. Instream construction for the CSPL2 project would be restricted to the summer low flow period, when sensitive steelhead life stages are absent in San Mateo Creek. The Crystal Springs Dam Bridge Replacement project would not involve construction in the stream channel and although there could be a risk of construction debris entering the channel and impacting fish during demolition and rebuilding of the bridge, active construction would not be concurrent with the LCSDI project. Therefore, there would be no cumulative impact during this period associated with the CSSA, CSPL2, or Crystal Springs Dam Bridge Replacement projects.

For the LCSDI project, implementation of Mitigation Measures M-HY-3 (Preparation of a SWPPP), M-BI-12a (Fish Rescue and Relocation), M-BI-12b (Vibration Monitoring), and M-BI-13 (Enhancement of Existing Fisheries Habitat) would ensure the project does not contribute cumulative impacts on fisheries resources in San Mateo Creek. With implementation of these measures, the proposed project would not have a cumulatively considerable impact on steelhead (*less than significant*).

With respect to operational impacts, none of the identified projects listed in Table 5.1-1 would result in operational impacts on fisheries resources or contribute to long-term cumulative impacts on fisheries resources and associated habitats. Some of the projects, such as the SFPUC's Habitat Reserve Program and Polhemus Creek Restoration, would result in a beneficial impact on biological resources, including fisheries. Therefore, no cumulative impacts on fisheries resources would be associated with operation of the LCSDI project when considered in combination with past, present, and foreseeable future projects.

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5.14 Geology and Soils

This section analyzes the potential for the Lower Crystal Springs Dam Improvements (LCSDI) project to be affected by or to increase risks associated with identified geologic and seismic hazards. The setting focuses on the existing geologic conditions that are most relevant to potential impacts that could occur during project construction and operations. Descriptions of geology, soils, and seismic hazards rely on information gathered from the U.S. Geological Survey (USGS), the California Geological Survey (CGS), and geotechnical investigations performed for the Lower Crystal Springs Dam (LCSD) and other SFPUC projects in the LCSDI project vicinity.

5.14.1 Setting

5.14.1.1 Regional Physiography

The LCSD is located on the San Francisco Peninsula, which is part of the Coast Ranges Geomorphic Province (Coast Ranges). The topography of the Coast Ranges is characterized by northwest-southeast-trending mountain ridges and intervening valleys that have formed over millions of years due to movements of the earth's crust. The bedrock underlying the Coast Ranges is referred to as the Franciscan Complex—a mixture of ancient seafloor sediments and volcanic rocks that have undergone alteration by heat and pressure deep within the earth. This rock unit forms most of the hills and mountains of the Peninsula region. In the vicinity of the LCSD, geologically younger sediments deposited by San Mateo Creek overlie the Franciscan Complex bedrock.

5.14.1.2 Site Geology

The topography of the LCSD area is characterized by very steep canyon slopes descending to San Mateo Creek, the outlet of Crystal Springs Reservoir, which is located at an elevation of approximately 150 feet above mean sea level. The dam abutments are comprised of mélange of the Jurassic-age Franciscan Complex bedrock (*fsr*), as shown on **Figure 5.14-1** (USGS, 1998). Approximately 15 to 30 feet of Holocene-age stream channel deposits (*Qhsc*) and alluvial fan and fluvial deposits[1] (*Qhaf*) from San Mateo Creek fill the valley floor, forming a broad flat area where the Crystal Springs Pump Station, the PG&E Substation, and the abandoned Chlorine and Fluoride Building are located.

Regionally, the Franciscan mélange is described as consisting predominantly of greywacke (sandstone), siltstone, and shale, substantial portions of which have been sheared. This unit may also include hard blocks of all other Franciscan rock types. In the vicinity of the dam abutments, the Franciscan mélange consists of greywacke and shale. On the north abutment, the sandstone bedrock is commonly severely weathered and weak for 2 to 3 feet near its surface (AGS, 1990). The underlying sandstone is generally moderately to slightly weathered, closely to moderately

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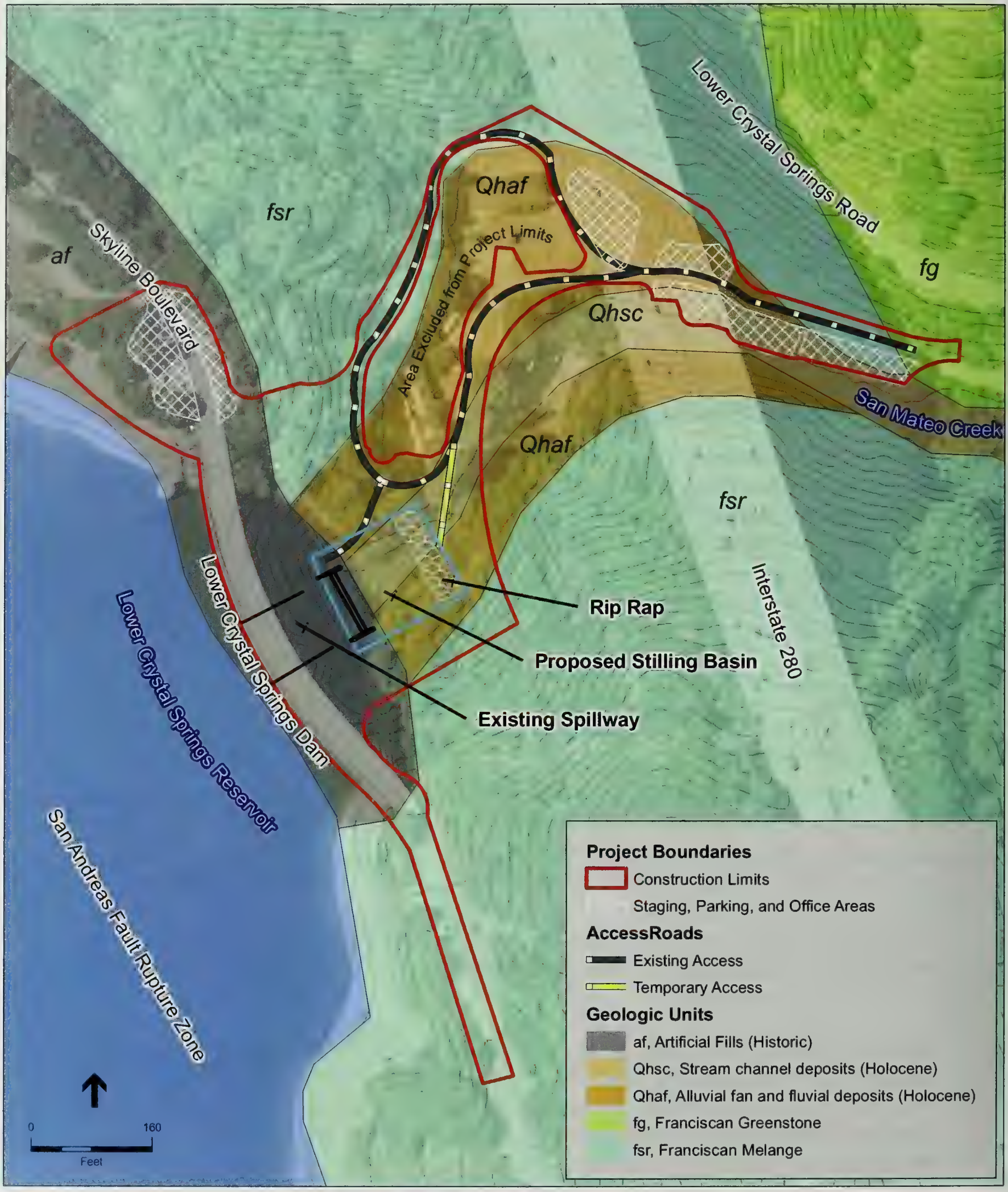
[1] An alluvial fan is a fan-shaped deposit of sand, silt, or mud formed at the point where a stream emerges from a ravine into a plain or other relatively flat area. Fluvial deposits include sediments deposited in a stream channel, along a stream bank, or on a floodplain.


Lower Crystal Springs Road
fg
Qhaf
fsr
af
Skyline Boulevard
Area Excluded from Project Limits
Qhsc
San Mateo Creek
Qhaf
fsr
Interstate 280
Rip Rap
Proposed Stilling Basin
Existing Spillway
Lower Crystal Springs Dam
Lower Crystal Springs Reservoir
San Andreas Fault Rupture Zone
0
160
Feet
Project Boundaries
Construction Limits
Staging, Parking, and Office Areas
AccessRoads
Existing Access
Temporary Access
Geologic Units
af, Artificial Fills (Historic)
Qhsc, Stream channel deposits (Holocene)
Qhaf, Alluvial fan and fluvial deposits (Holocene)
fg, Franciscan Greenstone
fsr, Franciscan Melange

SOURCE: Entrix, 2007; USGS, 1998; ESA + Orion, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.14-1
Site Geology

fractured, and weak to moderately strong. One small shear zone was noted in the sandstone. In the south abutment, the bedrock is predominantly greywacke that is moderately to slightly weathered, moderately to intensely fractured, and weak to moderately strong. Weathered and intensely fractured shale was noted in one trench completed in this abutment. Sandstone beneath the proposed stilling basin is moderately to slightly weathered and closely to moderately fractured.

The dam abutments are mantled by approximately 4 feet to over 20 feet of colluvium[2] on the north abutment and approximately 2.5 feet to over 10 feet of colluvium on the south abutment (AGS, 1990). The dam and area to the north are mapped as artificial fill (*af*) (USGS, 1998).

The Holocene-age stream channel deposits (*Qhsc*) and alluvial fan and fluvial deposits (*Qhaf*) from San Mateo Creek directly overlie the Franciscan mélange on the valley floor. Regionally, the alluvial fan and fluvial deposits are described as gravelly sand or sandy gravel that generally grades upward to sandy or silty clay, and the stream channel deposits are described as sand, silt, silty sand, or sandy gravel with minor cobbles. Within the project area, these deposits are described as alluvial fan and older alluvium materials consisting of silty gravel and cobbles with lenses of fine silty sand; sandy gravel; and sandy clay with some clean sand and gravel lenses (W.A. Wahler and Associates, 1977; AGS, 1990). In the vicinity of the stilling basin, the depth to bedrock is approximately 15 to 20 feet at an elevation of 140 to 145 feet mean sea level (AGS, 1990).

Artificial fill is reported to blanket the level area in the vicinity of the Crystal Springs Pump Station, PG&E Substation, and abandoned Chlorine and Fluoride Building (GTC, 2008). This fill is described as clayey sand to silty or sandy clay containing a large amount of Franciscan Complex–derived gravel. In this area, the artificial fill is underlain by colluvium and alluvial sediments. The depth to Franciscan Complex bedrock ranges from 18 to 31 feet.

The Sampling Station #5 site is relatively flat at an elevation of approximately 300 feet. This site is underlain by an alluvial fan and fluvial deposits (*Qhaf*) (USGS, 1998). Staging Area 9 at the boat ramp is underlain by serpentinite of the Franciscan Complex (*sp*). Serpentinite is a rock consisting of one or more serpentine minerals (a naturally occurring group of minerals that can be formed when ultramafic rocks[3] are metamorphosed during uplift to the earth's surface).

5.14.1.3 Geologic Hazards

Slope Failures

Slope failures, commonly referred to as landslides, include many phenomena that involve the downslope displacement and movement of material, triggered either by static (i.e., gravity) or dynamic (i.e., earthquake) forces. Exposed rock slopes undergo rockfalls, rockslides, or rock avalanches, while soil slopes experience soil slumps, rapid debris flows, and deep-seated rotational slides. Slope stability can depend on a number of complex variables, including the geology, structure, and amount of groundwater, as well as external processes such as climate, topography, slope geometry, and human activity. The factors that contribute to slope movements include those that decrease the resistance in the slope materials and those that increase the stresses on the slope. Landslides can occur on slopes of 15 percent or less, but the probability is greater on steeper slopes that exhibit old landslide features such as scarps, slanted vegetation, and transverse ridges.

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[2] Colluvium is a loose deposit of rock debris that is accumulated at the base of a cliff or slope through the action of gravity.

[3] Ultramafic rocks are formed in high-temperature environments well below the surface of the earth.

The best available predictor of where slides and earth flows might occur is the distribution of past movements (Nilsen and Turner, 1975). In 1997, the USGS released a preliminary map and geographic information system (GIS) database that provides a summary of the distribution of landslides evident in the landscape of the San Francisco Bay region (USGS, 1997). The map is a digitized nine-county compilation of existing landslides that has been used to divide the area into four landslide zones, including "mostly landslides," "many landslides," "few landslides," and "flatland." The project area is located within an area identified as "few landslides," which is defined as an area that "contains few, if any, large mapped landslides, but locally contains scattered small landslides and questionably identified larger landslides."

The geotechnical report for the proposed new Crystal Springs Pump Station included an analysis of slope stability for the north dam abutment, in the vicinity of the existing pump station and PG& E Substation (GTC, 2008). The analysis concluded that the slope is stable under static conditions (i.e., without disturbance or the effects of earthquake-induced groundshaking).

A small landslide occurred immediately west of the existing electrical substation, more than 300 feet northeast of the proposed stilling basin, in March and April of 1999. The landslide occurred in a small swale where groundwater accumulated and measured 50 feet across by 70 feet long and about 6 feet deep (AGS, 1999). It was repaired through the construction of a retaining wall at the toe, and construction of surface and subsurface drainage devices.

The Sampling Station #5 site is located in an area mapped by the USGS as "flatland," which includes areas of gentle slope at a low elevation that have little or no potential for slope failures, except along stream banks and terrace margins (USGS, 1997). Staging Area 9 is located in an area mapped by the USGS as "few landslides".

Naturally Occurring Asbestos

As discussed above, mélange of Franciscan Complex bedrock comprises both dam abutments and also underlies the alluvial sediments in the valley floor. This rock unit typically contains naturally occurring asbestos, primarily in the form of chrysotile or amphibole asbestos; fill or alluvial materials derived from the bedrock could therefore also contain naturally occurring asbestos. The potential to encounter naturally occurring asbestos is addressed in Section 5.16, Hazards and Hazardous Materials.

5.14.1.4 Regional Faulting and Seismic Hazards

Seismicity

The San Francisco Bay Area is situated near the boundary between two major tectonic plates, the Pacific Plate to the southwest and the North American Plate to the northeast. Since the Miocene epoch (approximately 23 million years ago), about 200 miles of right-lateral movement[4] has occurred along the San Andreas Fault Zone to accommodate the relative movement between these two plates. The movement between the Pacific Plate and the North American Plate generally occurs across a 50-mile zone extending from the San Gregorio fault in the southwest to the Great Valley Thrust Belt to the northeast. In addition to the right-lateral slip movement between the two tectonic plates, portions of the North American Plate have moved towards each other during the last 3.5 million years, resulting in compressional forces at the latitude of San Francisco Bay (Fenton and Hitchcock, 2001).

Figure 5.14-2 shows the locations of active[5] and potentially active[6] faults in the San Francisco Bay region. The San Andreas, San Gregorio, Hayward, Rodgers Creek, Calaveras, and Greenville strike-slip faults[7] are active faults of the San Andreas system that predominantly accommodate lateral movement between the North American and Pacific tectonic plates. Active blind- and reverse-thrust faults[8] in the San Francisco Bay region that accommodate compressional movement include the Monte Vista–Shannon and Mount Diablo faults.

The USGS estimates that there is a 63 percent probability of a strong earthquake (magnitude 6.7 or higher) occurring on one of the regional faults in the 30-year period between 2003 and 2032, with a 21 percent chance of such an earthquake occurring on the northern San Andreas fault, the closest fault to the proposed project (USGS, 2008). Strong groundshaking and other earthquake-related phenomena could occur at the project site due to a major earthquake on the San Andreas fault or one of the other regional faults, including the Hayward and Calaveras faults—each of which parallels the San Andreas fault and is capable of generating large (greater than magnitude 6.7) earthquakes. The San Andreas fault is located approximately 300 feet to the west of the LCSD (Figure 5.14-2). The Hayward fault zone is approximately 18 miles to the east of the project site, and the Calaveras fault zone is approximately 32 miles to the east of the project site.

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[4] The Pacific Plate and the North American Plate are moving past each other along the San Andreas Fault Zone; "right-lateral movement" means that they are moving to the right relative to each other.

[5] An active fault is one that shows geologic evidence of movement within Holocene time (approximately the last 11,000 years).

[6] A potentially active fault is one that shows geologic evidence of movement during the Quaternary (approximately the last 1.6 million years).

[7] Strike-slip faults involve the two blocks moving parallel to each other without a vertical component of movement.

[8] A reverse fault is one with predominantly vertical movement in which the upper block moves upward in relation to the lower block; a thrust fault is a low-angle reverse fault. Blind-thrust faults are low-angled subterranean faults that have no surface expression.

Fault Rupture

Surface rupture occurs when movement on a fault deep within the earth breaks through to the surface. Surface ruptures associated with the 1906 San Francisco earthquake extended for more than 260 miles, with displacements of up to 21 feet. However, not all earthquakes result in surface rupture. The Loma Prieta earthquake of 1989 caused major damage in the San Francisco Bay Area, but the fault movement did not break through to the ground surface.

Fault rupture almost always follows preexisting faults, which are zones of weakness. Rupture may occur suddenly during an earthquake or slowly in the form of fault creep. Sudden displacements are more damaging to structures because they can suddenly displace structures and are accompanied by shaking. Fault creep is the slow rupture of the earth's crust. In developed areas, fault creep can offset and deform curbs, streets, buildings, and other structures that lie on the fault trace. Although a small northeast-trending fault associated with the San Andreas fault is mapped about 170 feet west of the north abutment (W.A.Wahler and Associates, 1977). The mapped trace of the San Andreas fault traverses Staging Area 9 (USGS, 1998), but no active fault traces traverse the remainder of the LCSD project area. A seismic stability study of the LCSD concluded that the potential for fault rupture in the dam foundation is remote (W.A.Wahler and Associates, 1977).

Sampling Station #5 is located within the San Andreas Earthquake Fault Zone, but the active trace of the San Andreas fault is mapped approximately one-quarter mile to the southwest of the sampling station (AGS, 2001). The inactive Cañada fault may potentially cross the west end of the Pulgas Discharge Channel, to the west of Sampling Station #5. Thus, no active fault traces traverse the Sampling Station #5 site.

Groundshaking

The intensity of the seismic shaking, or strong ground motion, during an earthquake is dependent on the distance between the project area and the epicenter of the earthquake, the magnitude of the earthquake, and the geologic conditions underlying and surrounding the project area. Earthquakes occurring on faults closest to the project area would most likely generate the largest ground motions. The LCSD has maintained its structural integrity through groundshaking from both the 1906 San Francisco earthquake and the Loma Prieta earthquake of 1989. A seismic stability study of the LCSD concluded that the risk of major structural damage to the dam and its foundation from the maximum credible earthquake is low (W.A.Wahler and Associates, 1977).

The intensity of earthquake-induced ground motions and the potential forces affecting structures within the project area can be described using peak ground accelerations, which are represented as a fraction of the acceleration of gravity (g).[9] For the project area, the CGS estimates the peak ground acceleration for the 10 percent probability of exceedance in 50 years (475-year return period) at 0.69g (CGS, 2009). However, this estimate of peak ground acceleration is used

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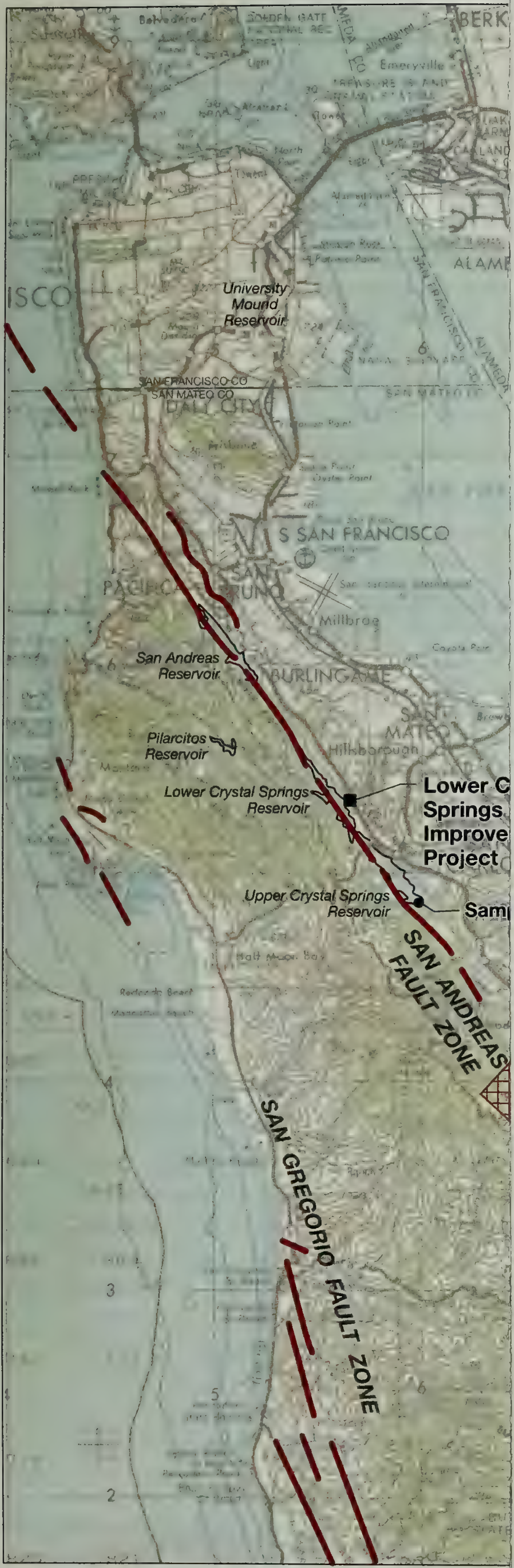
[9] Acceleration of gravity (g) = 980 centimeters per second squared. 1.0 g of acceleration is a rate of increase in speed equivalent to a car traveling 328 feet from rest in 4.5 seconds.

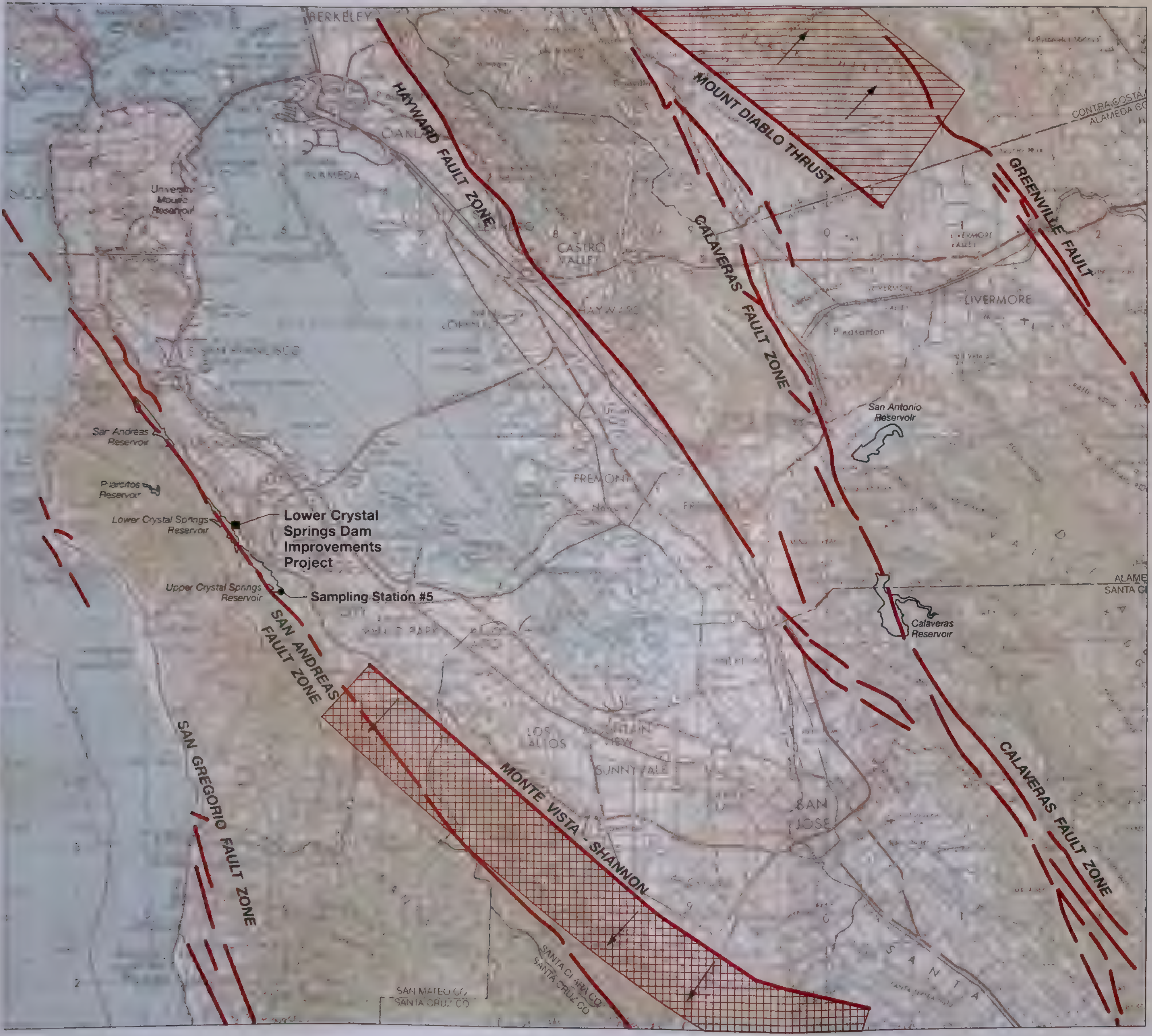


▬	Active Fault
▬	Pre-Quaternary considered Potentially Active
▭	Blind Thrust Fault (fault does not intersect the surface, heavy solid line represents projection of the upper edge of the fault to the surface and rectangle represents the projection of the fault plane to the surface. Arrow points in the dip direction.)
▦	Reverse Thrust Fault (fault does not intersect the surface, heavy solid line represents projection of the upper edge of the fault to the surface and rectangle represents the projection of the fault plane to the surface. Arrow points in the dip direction.)

SOURCE: ESA+Orion JV, 2006. Fault information based on: California Geological Survey (CGS), /Probabilistic Seismic Hazard Assessment For The State Of //California//, Appendix A: Fault Source Parameters/, revised in 2002, from CDMG Open File-Report 96-08, accessed at http://www.consrv.ca.gov/CGS/rghm/psha/ofr9608/, 2002.

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.14-2
Major Regional Faults



- Active Fault
- Pre-Quaternary considered Potentially Active
- ▭ Blind Thrust Fault (fault does not intersect the surface, heavy solid line represents projection of the upper edge of the fault to the surface and rectangle represents the projection of the fault plane to the surface. Arrow points in the dip direction.)
- ▦ Reverse Thrust Fault (fault does not intersect the surface, heavy solid line represents projection of the upper edge of the fault to the surface and rectangle represents the projection of the fault plane to the surface. Arrow points in the dip direction.)

SOURCE: ESA+Orion JV, 2006. Fault information based on. California Geological Survey (CGS), /Probabilistic Seismic Hazard Assessment For The State Of //California//, Appendix A: Fault Source Parameters/, revised in 2002, from CDMG Open File-Report 96-08 accessed at http://www.consrv.ca.gov/CGS/rghm/psha/ofr9608/, 2002

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.14-2
Major Regional Faults

primarily for formulating building codes and for designing buildings, and is not intended for site-specific hazard analysis. Therefore, it would be necessary to conduct a site-specific evaluation to estimate peak ground accelerations at a level suitable for project design.

Liquefaction

Liquefaction is a phenomenon in which saturated granular sediments temporarily lose their shear strength during periods of earthquake-induced strong groundshaking. The susceptibility of a site to liquefaction is a function of the depth, density, and water content of the granular sediments and the magnitude of earthquakes likely to affect the site. Saturated, unconsolidated silts, sands, silty sands, and gravels within 50 feet of the ground surface are most susceptible to liquefaction. Liquefaction-related phenomena include vertical settlement from densification, lateral spreading, ground oscillation, flow failures, loss of bearing strength, subsidence, and buoyancy effects.

The USGS has mapped the artificial fill materials in the LCSD area as having a low liquefaction potential, and the remainder of the LCSD area, including Staging Area 9, as having a very low liquefaction potential (USGS, 2006). The USGS estimates that about 2 percent of future liquefaction effects would occur within geologic units assigned a low liquefaction potential, and less than 2 percent of future liquefaction effects would occur within geologic units assigned a very low liquefaction potential.

Regional maps of liquefaction susceptibility are based on the general characteristics of the geologic formations, and it is necessary to conduct a site-specific geotechnical investigation to evaluate liquefaction hazards on a project-specific basis. The geotechnical report prepared for the proposed Crystal Springs Pump Station evaluated the liquefaction potential in the vicinity of the existing PG&E Substation (GTC, 2008). This report concluded that potentially liquefiable materials are present along the north bank of San Mateo Creek, and that up to 6 inches of settlement could occur in the event of strong groundshaking.

The USGS has mapped the alluvial fan and fluvial deposits in the vicinity of Sampling Station #5 as having a moderate liquefaction potential (USGS, 2006). The USGS estimates that about 20 to 30 percent of future liquefaction effects would occur within geologic units assigned a moderate liquefaction potential.

Lateral Spreading

Of the liquefaction hazards, lateral spreading generally causes the most damage. This is a phenomenon where large blocks of intact, nonliquefied soil move downslope on a liquefied substrate of large areal extent (Youd and Perkins, 1978). The mass moves toward an unconfined area, such as a descending slope or stream-cut bluff, and this movement can occur on slope gradients as gentle as 1 degree. Drainages and swales between hill slopes are generally filled by unconsolidated alluvium, colluvium, landslide debris, and slope wash and can experience lateral spreading. The geotechnical report for the proposed Crystal Springs Pump Station (GTC, 2008) concluded that lateral spreading in the vicinity of the LCSD could result in minor displacement of soil along the banks of San Mateo Creek due to slope failure caused by underlying liquefiable alluvial sediments. Although Sampling Station #5 is in an area mapped as having a moderate liquefaction potential, there would be a low potential for lateral spreading at this site because it is flat and there are no nearby exposed slopes.

Earthquake-Induced Settlement

Settlement of the ground surface can be accelerated and accentuated by earthquakes. During an earthquake, settlement can occur as a result of the relatively rapid rearrangement, compaction, and settling of subsurface materials (particularly loose, noncompacted, and variable sandy sediments). Settlement can occur both uniformly and differentially (i.e., where adjoining areas settle at different rates). Areas are susceptible to differential settlement if underlain by compressible sediments, such as poorly engineered artificial fill or bay mud. The geotechnical report for the proposed Crystal Springs Pump Station (GTC, 2008) concluded that in the LCSD area, post-liquefaction settlement of materials below the groundwater table could be up to 6 inches. Earthquake-induced settlement could also occur at Sampling Station #5 because this site is underlain by alluvial and fluvial sediments with a moderate liquefaction potential.

Seismic Slope Instability and Ground Cracking

Earthquake motions can also induce substantial stresses in slopes, causing earthquake-induced landslides or ground cracking when the slope fails. Earthquake-induced landslides can occur in areas with steep slopes that are susceptible to strong ground motion during an earthquake. The 1989 Loma Prieta earthquake triggered thousands of landslides over an area of 770 square miles. The CGS has not yet mapped areas of potential earthquake-induced landslides in the project area.

The geotechnical report for the proposed Crystal Springs Pump Station in the LCSD vicinity included an analysis of the seismic stability of the north dam abutment near the existing pump station and PG&E Substation (GTC, 2008). The analysis concluded that the slope would perform satisfactorily when subjected to seismic groundshaking from an earthquake with a 10 percent probability of exceedance in 50 years (475-year return period). There would be a low potential for seismically induced landslides and associated effects at Sampling Station #5 because this site is located in a flat area mapped by the USGS as "flatland."

5.14.2 Regulatory Framework

5.14.2.1 Federal Regulations

There are no federal regulations governing geologic and seismic hazards that are applicable to the proposed project.

5.14.2.2 State Regulations

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to address the hazard of surface faulting to structures for human occupancy. In accordance with this act, the state geologist has established regulatory zones, called "earthquake fault zones," around the surface traces of active faults and has published maps showing these zones. Within these zones, buildings for human occupancy cannot be constructed across the surface trace of active faults. Each earthquake fault zone extends approximately 200 to 500 feet on either side of the mapped fault trace because many active faults are complex and consist of more than one branch that may experience ground surface rupture.

Title 14 of the California Code of Regulations (CCR), Section 3601(e), defines buildings intended for human occupancy as those that would be inhabited for more than 2,000 hours per year. The proposed project does not include any buildings that meet this criterion for human occupancy, and the Alquist-Priolo Earthquake Fault Zone for the San Andreas fault is located approximately 240 feet to the west of the proposed improvements at the LCSD (Figure 5.14-1). Therefore, this act does not apply to the proposed project.

Seismic Hazard Mapping Act

The Seismic Hazards Mapping Act was passed in 1990 following the Loma Prieta earthquake to reduce threats to public health and safety and to minimize property damage caused by earthquakes. The act directs the Department of Conservation to identify and map areas prone to the earthquake hazards of liquefaction, earthquake-induced landslides, and amplified groundshaking. For structures intended for human occupancy, the act requires site-specific geotechnical investigations to identify potential seismic hazards and the formulation of mitigation measures prior to permitting most developments designed for human occupancy within the Zones of Required Investigation. Seismic hazard mapping has not been completed for the project area. However, the project does not propose the construction of any structures for human occupancy. Therefore, this act does not apply to the proposed project.

Building Codes

The California Building Code (CBC), which is codified in Title 24 of the CCR, Part 2, was promulgated to safeguard the public health, safety, and general welfare by establishing minimum standards related to structural strength, egress facilities, and general building stability. The purpose of the CBC is to regulate and control the design, construction, quality of materials, use/occupancy, location, and maintenance of all buildings and structures within its jurisdiction. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under state law, all building standards must be centralized in Title 24 or they are not enforceable.

The CBC is based on the International Building Code. The 2007 CBC is based on the 2006 International Building Code published by the International Code Conference. In addition, the CBC contains necessary California amendments that are based on the American Society of Civil Engineers (ASCE) Minimum Design Standards 7-05. ASCE 7-05 provides requirements for general structural design and includes means for determining earthquake loads as well as other loads (flood, snow, wind, etc.) for inclusion in building codes. The provisions of the CBC apply to the construction, alteration, movement, replacement, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

The earthquake design requirements take into account the occupancy category of the structure, site class, soil classifications, and various seismic coefficients, all of which are used to determine a Seismic Design Category (SDC) for a project. The SDC is a classification system that combines the occupancy categories with the level of expected ground motions at the site, and ranges from SDC A (very small seismic vulnerability) to SDC E/F (very high seismic vulnerability and near a major fault). Design specifications are then determined according to the SDC.

The Building Seismic Safety Council acknowledges that dams and other lifeline facilities are not typical building structures, are not typically under the jurisdiction of local building officials, and require technical considerations beyond the scope of the CBC (Building Seismic Safety Council, 2003).

Division of Safety of Dams

The Department of Water Resources, with regulatory power under Division 3 of the California Water Code and Title 23, Division 2 of the CCR, delegates dam safety to the Division of Safety of Dams (DSOD) to protect people against loss of life and property from dam failure. DSOD engineers and engineering geologists review and approve plans and specifications for the design of dams and oversee their construction to ensure compliance with the approved plans and specifications. Geologic and seismic reviews include site geology, seismic setting, geologic/ geotechnical site investigations, construction material evaluation, and seismic dam stability. In addition, DSOD engineers conduct annual inspections of existing dams under DSOD jurisdiction to ensure the dams are performing and being maintained in a safe manner. The proposed dam improvements will be reviewed for approval by the DSOD.

5.14.2.3 Local Regulations

SFPUC Peninsula Watershed Management Plan

The *Peninsula Watershed Management Plan* (WMP) provides a policy framework for the SFPUC to make consistent decisions about the activities, practices, and procedures that are appropriate on SFPUC lands in the Peninsula watershed, where the LCSD is located. A number of policies are intended to reduce risks from geologic and seismic hazards, including:

- Policy S4: Minimize damage from future seismic hazards by avoiding construction of facilities in active fault zones and traces, where feasible.
- Policy S5: Minimize damage from potential mass movement hazards by avoiding construction or other disturbances in known dormant landslides and on slopes greater than 30 percent, without proper engineering.
- Policy S6: Conduct (for CCSF-owned) and require (for easements) inspection of facilities and utilities near active landslide areas and fault traces following earthquakes and slope failures to assess their stability and integrity, and complete repairs or further monitoring as needed to prevent geohazards.

- *Policy S7*: Require adequate seismic and static geohazards engineering studies for proposed facilities, infrastructure, and utilities easements within the watershed.

- *Policy WQ14*: Minimize, and where possible prohibit, land uses and activities that have the potential to cause erosion, sediment generation, and stormwater runoff.

- *Policy WQ15*: Where suitable, use sedimentation basins to control the effects of erosion and sediment transport.

- *Policy WA24*: Require that all proposed development involving any grading of land includes the submittal of a grading plan to SFPUC to retain the existing topography where feasible, minimize grading, minimize the impacts on scenic, ecological, and cultural resources, and minimize offsite soil loss from erosion.

5.14.3 Impacts and Mitigation Measures

5.14.3.1 Significance Criteria

The City and County of San Francisco (CCSF) has not formally adopted significance standards for impacts related to geology, soils, and seismicity, but generally considers that implementation of the proposed project would have a significant impact if it were to:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the state geologist for the area or based on other substantial evidence of a known fault (refer to Division of Mines and Geology Special Publication 42),
  - Strong seismic groundshaking,
  - Seismic-related ground failure, including liquefaction, or
  - Landslides;

- Result in substantial soil erosion or the loss of topsoil;

- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse;

- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code, creating substantial risks to life or property;

- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater; or

- Substantially change the topography or any unique geologic or physical features of the site.

Due to the nature of the proposed project, there would be no impact related to the following topics:

> *Expansive Soil*. The only structure to be built under the proposed project is the stilling basin, which would be constructed to a depth of 40 feet within the channel of San Mateo Creek. It is not expected that the creek channel has a strongly developed soil profile. Therefore, this structure would not be affected by expansive soil, and there would be no impact related to risks to life and property from expansive soils.
>
> *Soils Capable of Supporting Septic Tanks or Alternative Wastewater Disposal Systems*. The proposed project would not result in the production or disposal of wastewater. Therefore, impacts related to the capacity of soils in the project area to support septic tanks or alternative wastewater disposal systems are not applicable.
>
> *Substantial Change in Topography or Unique Geologic or Physical Features*. The only excavation to be conducted under the proposed project would be done for construction of the stilling basin, which would be located within San Mateo Creek at the toe of the dam. This excavation and minor grading would take place at the staging areas and would not substantially change the topography or affect a unique geologic or physical feature. Therefore, there would be no impact related to this criterion.

5.14.3.2 Approach to Analysis

The SFPUC has developed performance objectives and design criteria for proposed improvements to the LCSD in accordance with DSOD seismic design criteria (SFPUC and URS, 2008). The following impact analysis assumes that the SFPUC would incorporate these objectives and criteria into the design of the project, which would ensure that the improved facilities would not be substantially damaged in the event of a major earthquake. Therefore, impacts related to seismic hazards, including fault rupture, ground motions generated by earthquakes (groundshaking), seismic-related ground failure (liquefaction and settlement), and landslides, would generally be less than significant, as discussed below. For impact areas that are not addressed by the performance objectives and design criteria (i.e., landsliding during construction and soil erosion), the analysis below evaluates the potential for significant effects based on the site-specific geologic conditions.

5.14.3.3 Impact Summary

Table 5.14-1 summarizes the proposed project's geology and soils impacts and significance determinations.

TABLE 5.14-1
SUMMARY OF IMPACTS – GEOLOGY AND SOILS

Impact	Significance Determination	
	LCSDI Site	**Sampling Station Site**
Impact GE-1: Slope instability during construction.	LS	LS
Impact GE-2: Erosion and loss of topsoil.	PSM	LS
Impact GE-3: Surface fault rupture.	LS	LS
Impact GE-4: Seismically induced groundshaking.	LS	LS
Impact GE-5: Seismically induced ground failure, including liquefaction, lateral spreading, and settlement.	LS	LS
Impact GE-6: Seismically induced landslides or other slope failures.	LS	LS
Impact C-GE: Cumulative impacts on geology, soils, and seismicity.	LS	LS

B = Beneficial impact
N/A = Not Applicable or no impact
LS = Less than Significant impact, no mitigation required
SM = Significant impact, can be Mitigated to less than significant
PSM = Potentially Significant impact, can be Mitigated to less than significant
SU = Significant Unavoidable impact
PSU = Potentially Significant Unavoidable impact

5.14.3.4 Construction Impacts

Impact GE-1: Slope instability during construction.

Lower Crystal Springs Dam Vicinity

Natural or constructed slopes can become destabilized during construction-related excavation and/or grading operations, particularly if material is added to the head of the slope or removed from the toe (or bottom) of the slope. Construction of the proposed stilling basin would require excavation within approximately 15 to 20 feet of colluvium and alluvial materials located at the bottom of the dam abutments. Although the abutments are mapped by the USGS (1997) as having "few landslides," removal of this material from the toe of the slope could create unstable conditions and landslides during construction, potentially damaging the proposed facilities or other nearby facilities and properties and putting construction workers at risk. However, as described in Chapter 3, Project Description, the excavation for the stilling basin would be shored with soil nailing as excavation proceeds, and use of this shoring would prevent landsliding during construction. Through the use of shoring as part of the project, impacts related to slope instability during construction would be *less than significant*, and no mitigation is required.

Sampling Station #5 Vicinity

Sampling Station #5 is located within a flat area underlain by alluvial fan and fluvial deposits and would only include a limited amount of excavation (less than 10 cubic yards). Therefore, impacts related to slope instability during construction would be *less than significant* for this site, and no mitigation is required.

Impact GE-2: Erosion and loss of topsoil.

Lower Crystal Springs Dam Vicinity

Without proper soil stabilization controls, construction activities such as backfilling, grading, and compaction can increase the potential for long-term soil loss and erosion by wind and stormwater runoff through the removal of stabilizing vegetation and exposure of areas of loose soil. These activities can also result in the loss of topsoil, a fertile soil layer that typically contains a seed base, if soil layers are mixed during excavation and backfilling. Newly constructed and compacted engineered slopes can also undergo substantial erosion through dispersed sheet-flow runoff, and more concentrated runoff can cause the formation of small erosional channels and larger gullies, each compromising the integrity of the slope and resulting in significant soil loss.

Construction of the new stilling basin and grading required for the temporary access road and Staging Area 7 would not involve construction on an existing slope or result in newly constructed slopes that would increase the potential for long-term erosion. Therefore, geologic impacts related to soil erosion would be *less than significant*. Potential water quality impacts related to erosion during construction are addressed in Impact HY-3 (see Section 5.15, Hydrology and Water Quality).

The new stilling basin would be approximately 155 feet wide by 145 feet long (with riprap), which is larger than the existing 102-foot-long by 32-foot-wide stilling basin. Although larger, the new stilling basin would not result in a loss of topsoil because the entire basin would be constructed within the channel of San Mateo Creek, which does not have a developed topsoil layer. However, grading for the temporary construction access road and Staging Area 7 could remove topsoil in these areas. Depending on the current level of soil disturbance and the quality of the existing soils, removal of this topsoil would be a *potentially significant* impact. However, this impact would be reduced to a less-than-significant level with implementation of Mitigation Measure M-GE-2 (Replacement of Topsoil), which would require the contractor to remove topsoil, stockpile it separately, and replace the topsoil at the completion of construction.

Sampling Station #5 Vicinity

Construction activities at Sampling Station #5 would only include a limited amount of excavation (approximately 7 cubic yards). Therefore, impacts related to erosion and loss of topsoil would be *less than significant* for this site, and no mitigation is required.

5.14.3.5 Operational Impacts

Impact GE-3: Surface fault rupture.

Lower Crystal Springs Dam Vicinity

Although the San Andreas fault traverses Staging Area 9, there would be no new structures built at this site, and there would be no long-term increase in workers or visitors using this area, and therefore fault rupture at this site would not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death. The San Andreas Fault Zone is located approximately 230 feet to the west of the top of the LCSD (Figure 5.14-1), and none of the proposed improvements in this portion of the project area would be constructed within or near an active fault trace. Therefore, impacts related to surface fault rupture would be *less than significant,* and no mitigation is required.

Sampling Station #5 Vicinity

The San Andreas fault is mapped approximately one-quarter mile to the southwest of Sampling Station #5, and no active faults cross this site. Therefore, impacts related to fault rupture would be *less than significant* for this site, and no mitigation is required.

Impact GE-4: Seismically induced groundshaking.

Lower Crystal Springs Dam Vicinity

Groundshaking is the most widespread effect of earthquakes and poses a greater seismic threat than local ground rupture. Depending on the level of groundshaking, an earthquake could damage the stilling basin and other project improvements, reducing the capability of the dam to accommodate the Maximum Probable Flood and potentially endangering the health and welfare of people.

As discussed above in Section 5.14.1, Setting, groundshaking in the project area during an earthquake, measured as peak ground accelerations, is expected to be quite strong (0.69g). Although strong groundshaking could be experienced, the proposed stilling basin and project improvements would be designed to withstand groundshaking in accordance with DSOD seismic standards. With compliance with these standards, subject to review and approval by the DSOD, impacts related to groundshaking would be *less than significant,* and no mitigation is required.

Sampling Station #5 Vicinity

Although Sampling Station #5 could also be subjected to strong groundshaking, damage to this station in response to groundshaking would not expose people or structures to adverse effects, including loss, injury, or death. Therefore, impacts related to seismically induced ground shaking would be *less than significant* for this site, and no mitigation is required.

Impact GE-5: Seismically induced ground failure, including liquefaction, lateral spreading, and settlement.

Lower Crystal Springs Dam Vicinity

Liquefaction-related phenomena can include lateral spreading, ground oscillation, loss of bearing strength, subsidence, and buoyancy effects, all of which could cause damage to structures such as the stilling basin. As described above in Section 5.14.1, Setting, the USGS considers the alluvial sediments in the project area to have a very low liquefaction potential. The geotechnical investigation for the proposed Crystal Springs Pump Station (GTC, 2008) concluded that potentially liquefiable materials are present along the north bank of San Mateo Creek, and that lateral spreading and up to 6 inches of settlement could occur in the event of strong groundshaking. However, the stilling basin would be designed to withstand liquefaction-related phenomena in accordance with DSOD seismic standards, subject to review and approval by the DSOD. Therefore, impacts related to liquefaction would be *less than significant*, and no mitigation is required.

Sampling Station #5 Vicinity

Although Sampling Station #5 could also be subjected to liquefaction-related phenomena, damage to this station in response to these phenomena would not expose people or structures to adverse effects, including loss, injury, or death. Therefore, impacts related to liquefaction would be *less than significant* for this site, and no mitigation is required.

Impact GE-6: Seismically induced landslides or other slope failures.

Lower Crystal Springs Dam Vicinity

Slope instability (including landslides, earth flows, and debris flows) could displace or destroy the new stilling basin. As discussed in Impact GE-1, the dam abutments are mapped by the USGS as "few landslides." However, the geotechnical report for the proposed Crystal Springs Pump Station (GTC, 2008) concluded that the north dam abutment would perform satisfactorily when subjected to seismic groundshaking from an earthquake with a 10 percent probability of exceedance in 50 years (475-year return period). Regardless, the stilling basin would be designed and constructed to withstand seismically induced landslides in accordance with DSOD requirements; and the design would be subject to review and approval by the DSOD. Therefore, impacts related to seismically induced landslides or other slope failures would be *less than significant,* and no mitigation is required.

Sampling Station #5 Vicinity

Sampling Station #5 is located within a flat area underlain by alluvial fan and fluvial deposits and would only include a limited amount of excavation (less 10 cubic yards). Therefore, impacts related to seismically induced landslides or other slope failures would be *less than significant* for this site, and no mitigation is required.

5.14.3.6 Mitigation Measures

Mitigation Measure M-GE-2: Replacement of Topsoil.

If the SFPUC or its contractor determines that it is necessary to perform post-construction revegetation and restoration, and if the topsoil is determined to be of suitable quality, the contractor shall remove topsoil and stockpile it separately as part of site preparation and clearing for the staging areas. At the completion of construction, the contractor shall replace the topsoil in coordination with the site restoration and revegetation conducted under Mitigation Measure M-HY-3 (Preparation and Implementation of a SWPPP). Alternatively, if the topsoil is not of suitable quality, the contractor will import topsoil appropriate for site conditions as part of the restoration actions.

5.14.3.7 Cumulative Impacts

Impact C-GE: Cumulative impacts on geology, soils, and seismicity.

The geographic scope of potential cumulative impacts related to geology and soils encompasses the project site and immediate vicinity because these types of impacts are generally site-specific and depend on local geologic and soil conditions.

Potential project impacts related to seismic hazards, including fault rupture, groundshaking, and seismically induced ground failure (such as liquefaction and settlement) as well as project impacts related to expansive soil are project- and site-specific, and therefore no cumulative impact would occur. Potential impacts related to slope instability and seismically induced landslides as well as erosion and loss of topsoil are also restricted to the LCSD area and immediate vicinity, but cumulative impacts could occur since it is likely that LCSDI project construction activities would overlap with other projects at the same locations.

Of the cumulative projects listed in Table 5.1-1, the project areas of the San Mateo County's Crystal Springs Dam Bridge Replacement project, Crystal Springs/San Andreas (CSSA) Transmission Upgrade project, and Crystal Springs Pipeline No. 2 (CSPL2) Replacement project would overlap with the LCSDI project area at the dam, where potential impacts on geology and soils would occur. The bridge abutments for the Crystal Springs Dam Bridge Replacement project would be constructed on the hillslopes above the LCSD and could increase the potential for unstable slopes, soil erosion, and loss of topsoil. However, as described in Chapter 3, Project Description (see Section 3.8), the bridge would be replaced after the SFPUC completes construction of the LCSD improvements, so there would be no overlapping construction effects and therefore no cumulative impact to which the proposed project could contribute *(no impact)*.

The SFPUC's proposed Crystal Springs/San Andreas (CSSA) Transmission Upgrade project would include several improvements around the Crystal Springs Pump Station below the dam. These include replacing a portion of the Crystal CSSA Pipeline adjacent to the Crystal Springs

Pump Station, upgrading the LCSD outlet structures and tunnels conveying water to the Crystal Springs Pump Station, replacing the Crystal Springs Pump Station, constructing a new electrical substation, constructing new pipelines and appurtenances, and constructing a new outfall structure in San Mateo Creek. The CSPL2 Replacement project would replace a portion of the Crystal Springs Pipeline No. 2 starting at the Crystal Springs Pump Station and extending along the access road to Crystal Springs Road, adjacent to proposed Staging Areas 1 through 4. The construction schedule for both of these projects would overlap with the schedule for the proposed project in 2011.

Excavation activities for each of these projects could increase the potential for slope instability during construction, and changes in slope as a result of project construction could increase the potential for seismically induced landslides. This is a potential significant cumulative impact. However, the proposed project includes measures to address project-specific slope stability and to prevent slope failure during construction as well as seismically induced landslides. It is also assumed that the cumulative projects listed in Table 5.1-1 would include similar measures to address these same construction-related impacts. With implementation of project-specific measures, the proposed project would not contribute to a cumulative impact related to slope instability during construction or seismically induced landslides. Thus, the proposed project's contribution to this impact would be less than cumulatively considerable and therefore *less than significant*.

Geologic impacts related to erosion could occur if the cumulative projects involved the creation of new slopes or other features that could increase the long-term potential for erosion. This is a potentially significant cumulative impact. However, as discussed in Impact GE-2, the proposed project would not include construction on an existing slope or result in newly constructed slopes that would increase the potential for long-term erosion. Therefore, the project's contribution to this potential impact would not be cumulatively considerable and therefore the impact is *less than significant*.

All three of the overlapping cumulative projects, including the proposed project, could include the loss of topsoil as a result of excavation in areas with a well-developed topsoil horizon; this is a potentially significant cumulative impact. However, the proposed project includes mitigation that would require the contractor to segregate the topsoil during construction and replace the topsoil at the completion of construction (Mitigation Measure M-GE-2). With implementation of this mitigation, the proposed project would not result in a loss of topsoil. Therefore, the project's contribution to this potential impact would not be cumulatively considerable and therefore the impact is *less than significant*.

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5.15 Hydrology and Water Quality

This section addresses the hydrology and water quality impacts that could result from construction and operation of the Lower Crystal Springs Dam Improvements (LCSDI) project. It includes an evaluation of effects on water levels in Crystal Springs Reservoir, flows along lower San Mateo Creek, groundwater in the vicinity of the reservoir and Lower Crystal Springs Dam (LCSD), water quality in the reservoir and San Mateo Creek, and geomorphology of San Mateo, San Andreas, and Laguna Creeks. The description of operational effects on water levels in Crystal Springs Reservoir presented in this section is used in the analysis of operational impacts on biological resources, which is presented in Section 5.13, Biological Resources.

5.15.1 Setting

5.15.1.1 Surface Water Hydrology

Precipitation

The San Francisco Peninsula experiences a Mediterranean climate with cool, moist winters and warm, dry summers. Average annual rainfall over the Crystal Springs Reservoir watershed ranges from 25 to 40 inches, with more rainfall at the higher elevations. Average annual rainfall at the LCSD is 27 inches. Over 95 percent of the annual rainfall occurs between October and April (Balance Hydrologics, 1999). Although there is typically no rainfall between May and September, coastal fog is common.

Watersheds and Water Courses

The SFPUC refers to the lands it manages on the San Francisco Peninsula as the Peninsula watershed. The proposed project has the potential to affect hydrology, water quality, and geomorphology in two watersheds within the SFPUC's Peninsula watershed—the watershed above the LCSD, referred to here as the Crystal Springs Reservoir watershed, and the watershed below the LCSD, referred to here as the lower San Mateo Creek watershed. The Crystal Springs Reservoir watershed includes the upper San Mateo Creek sub-watershed, the San Andreas Creek sub-watershed, and the Laguna Creek sub-watershed. The lower San Mateo Creek watershed includes the Polhemus Creek sub-watershed.

The Crystal Springs Reservoir watershed lies in steep, partially wooded terrain in the Santa Cruz Mountains and has a drainage area of 29.4 square miles. The highest elevations in the watershed are about 2,000 feet above sea level. The upper portion of the lower San Mateo Creek watershed lies within the foothills of the Santa Cruz Mountains, and the lower portion lies within the flatlands that slope gently to San Francisco Bay. The lower San Mateo Creek watershed has an area of approximately 35 square miles.

Crystal Springs Reservoir Watershed

There are three major water courses in the Crystal Springs Reservoir watershed: San Mateo, San Andreas, and Laguna Creeks. San Mateo and San Andreas Creeks flow in a southeasterly direction and enter Crystal Springs Reservoir near its northern end. Laguna Creek flows toward the northwest and enters the reservoir at its southern end. San Andreas and Laguna Creeks are tributaries of San Mateo Creek, but the confluences of the creeks were inundated when the LCSD was built and Crystal Springs Reservoir was filled.

San Mateo Creek is a perennial stream, flowing into the reservoir year-round. Laguna and San Andreas Creeks are ephemeral; flow from the creeks into the reservoir ceases in the dry season in most years. Several small dams located along San Mateo Creek above Crystal Springs Reservoir create barriers and impound water. Water is diverted from these impoundments via tunnels and pipelines to San Andreas Reservoir. Flow from San Mateo Creek into Crystal Springs Reservoir is limited to runoff from the creek's watershed below the most downstream small dam, about 1.5 miles upstream of Crystal Springs Reservoir, and floodwater that overtops the small dam.

San Andreas Dam creates a barrier across San Andreas Creek about three miles upstream of Crystal Springs Reservoir. Flow from the upper reaches of San Andreas Creek is captured in San Andreas Reservoir. No water is released from San Andreas Dam to San Andreas Creek, and so only flow from the three miles of San Andreas Creek below the dam enters Crystal Springs Reservoir.

Lower San Mateo Creek Watershed

There are two major water courses in the lower San Mateo Creek watershed below the dam — lower San Mateo Creek itself and Polhemus Creek, a tributary that joins lower San Mateo Creek about 0.9 mile downstream of the LCSD. The reach of lower San Mateo Creek downstream of the dam flows for about 1.5 miles through a steep-sided canyon in a natural channel. Leaving the canyon, the creek flows through suburban and urban areas for about 5.2 miles before emptying to San Francisco Bay. In the suburban and urban areas, the natural drainage channels tributary to lower San Mateo Creek have been largely replaced by an engineered storm drainage system comprised of open channels and storm sewers. Sections of lower San Mateo Creek itself have been enclosed in culverts, straightened, and confined within a concrete channel; other sections remain in a natural condition, but have been influenced by their urban surroundings.

An approximately 450-foot-long reach of lower San Mateo Creek immediately downstream of the existing stilling basin at the LCSD includes two in-channel pools. Pool 1 lies upstream of Pool 2. The stilling basin and the two pools are separated by two short sections of wetlands through which the creek runs in poorly defined channels. A 60-inch-diameter pipe is designed to discharge to Pool 1, and 10 smaller pipes discharge to Pool 2. The SFPUC uses the pipes to discharge water from Crystal Springs Reservoir and the adjacent Crystal Springs Pump Station. The ponds were created by scour resulting from past large discharges of water from the pipes. Discharges from the pipes occur infrequently, but some leakage from the pipes occurs continuously.

During dry weather, flow in lower San Mateo Creek immediately below the LCSD is limited to leakage from the SFPUC pipes referred to above and seepage around and under the dam. Flow increases somewhat in a downstream direction as a result of tributary flow, groundwater discharge, and discharge of excess irrigation water from urban storm drains.

During wet weather, flow in the creek immediately below the dam is increased by stormwater runoff from Interstate 280 (I-280) and the Skyline Boulevard Bridge. Stormwater runoff from I-280 is discharged through a 30-inch stormwater drainage pipe on the south abutment of the dam into the stilling basin at the toe of the dam. Stormwater runoff from the Skyline Boulevard Bridge occurs as sheetflow that flows to the eastern edge of the bridge, onto the downward face of the dam, and then into the stilling basin and San Mateo Creek. Some additional stormwater runoff from I-280 and Crystal Springs Road enters lower San Mateo Creek near the I-280 bridge. Farther downstream, Polhemus Creek, other tributaries, and urban storm drains contribute to wet-weather flow in lower San Mateo Creek. The most downstream reach of lower San Mateo Creek is subject to tidal incursion of saltwater from San Francisco Bay.

Flow in lower San Mateo Creek is increased by releases from Crystal Springs Reservoir on very rare occasions. The maximum release rate is 600 cubic feet per second (cfs). More frequent (but still rare) releases are made to test valves and other equipment at the reservoir and the Crystal Springs Pump Station. In the last 25 years, the SFPUC has made three to four controlled releases to lower San Mateo Creek through the valves at the dam, and there have been no uncontrolled spills to lower San Mateo Creek over the top of the dam through the spillway.

There have been no long-term measurements of flow in lower San Mateo Creek below the LCSD or in Polhemus Creek. Several short-term measurements of flow in lower San Mateo Creek immediately below Pool 2 were made in 2008 and 2009. Dry-weather flow in the creek was estimated to be 0.7 cfs, with about 0.6 cfs attributable to leakage from pipes and the remaining 0.1 cfs to seepage under and around the dam (Johnson, 2008; also see **Appendix M**). The rate of leakage from pipes at the dam and the rate of seepage under and around the dam may increase and decrease in response to the rise and fall of water levels in Crystal Springs Reservoir, but any such effect is negligible. The rates of leakage and seepage are not expected to vary much from day-to-day or season-to-season; consequently, dry-weather flow in lower San Mateo Creek immediately below the dam is expected to be fairly constant, at about 0.7 cfs. Measurements made in August 2009 indicate that while dry-weather flow in lower San Mateo Creek continues to the creek's confluence with Polhemus Creek, some water is lost to the ground in the reach of the creek between Pool 2 and the confluence (Philip Williams and Associates, 2009).

During storms, flow in lower San Mateo Creek below the LCSD rapidly increases to as much as an estimated 100 cfs. The rapid increase in flow is attributable to the discharge of stormwater runoff from I-280 into the stilling basin, from where it flows into the creek.

A short-term measurement of flow in lower San Mateo Creek immediately below its confluence with Polhemus Creek was made in 2008. Dry-weather flow was estimated to be 1 to 2.6 cfs (Johnson, 2008).

Water Supply Facilities and Operations

Facilities

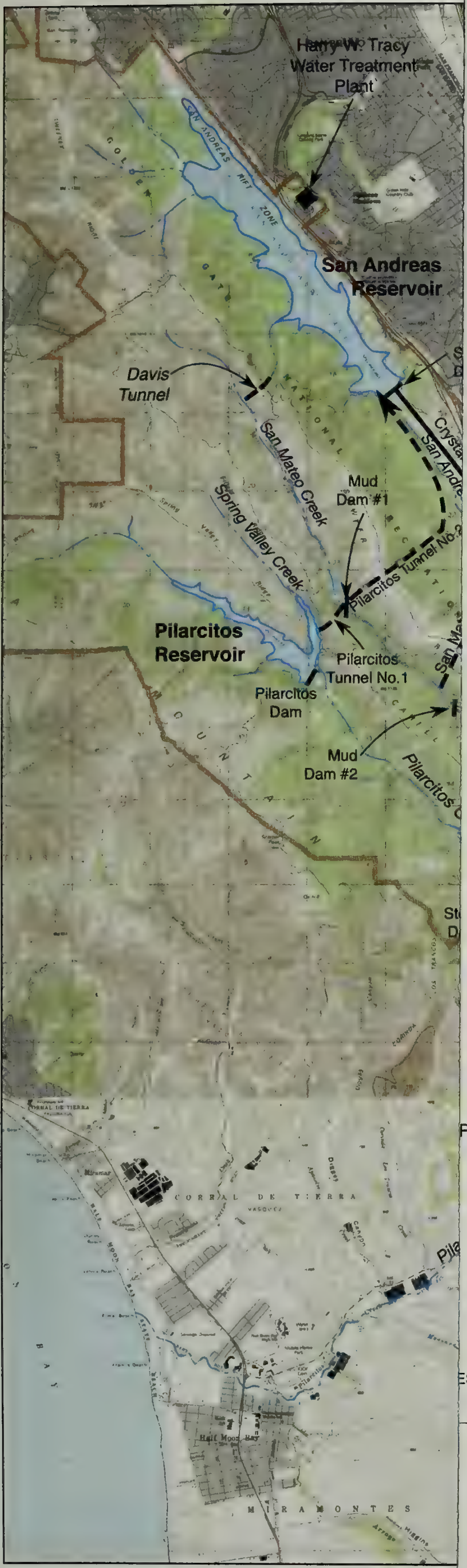
The SFPUC operates three water supply reservoirs on the San Francisco Peninsula—Crystal Springs, San Andreas, and Pilarcitos Reservoirs (see **Figure 5.15-1**). The maximum water surface or spillway elevations at San Andreas and Pilarcitos Reservoirs are 452 and 697 feet, respectively. At their maximum water surface elevations, San Andreas and Pilarcitos Reservoirs store 6.2 and 1 billion gallons of water, respectively. The historical maximum water surface elevation at Crystal Springs Reservoir is 291.8 feet, which corresponds with storage of 22.15 billion gallons of water. Since 1983, the California Department of Water Resources, Division of Safety of Dams (DSOD) has required that the water surface elevation in Crystal Springs Reservoir not exceed 283.8 feet, which corresponds with water storage of 18.5 billion gallons. Exceedences are permitted for brief periods, subject to written approval by the DSOD. Removal of the restriction on water storage is one of the goals of the LCSDI project (for more information on the DSOD-imposed operational restriction, see Chapter 3, Project Description).

The Tuolumne River is the primary source of water for Crystal Springs Reservoir. Tuolumne River water is conveyed by gravity approximately 120 miles from the SFPUC's Hetch Hetchy Reservoir in Yosemite National Park to the Pulgas Water Temple, where it is discharged to the southern end of Crystal Springs Reservoir. Water is withdrawn from Crystal Springs Reservoir and pumped uphill about 170 feet to San Andreas Reservoir, where it is withdrawn again, treated at the Harry Tracy Water Treatment Plant, and conveyed to water users in San Mateo and San Francisco Counties. The maximum capacity of the force main that delivers water from Crystal Springs Reservoir to San Andreas Reservoir is 75 million gallons per day (mgd).

Most of the time, about 85 percent of the water in Crystal Springs Reservoir has its origin in the Tuolumne River. The remainder is water transferred from the Pilarcitos and Alameda Creeks watersheds and stormwater runoff from the reservoir's watershed.

Pilarcitos Reservoir, the smallest of the SFPUC's three San Francisco Peninsula reservoirs, is located on Pilarcitos Creek on the west-facing slopes of the Santa Cruz Mountains. The reservoir stores only local runoff from the upper Pilarcitos Creek watershed. The SFPUC uses water stored in Pilarcitos Reservoir to supply water to one of its suburban customers, Coastside County Water District, but it also diverts water from Pilarcitos Creek to San Andreas and Crystal Springs Reservoirs.

Excess Pilarcitos Creek water not needed to fill Pilarcitos Reservoir or to meet Coastside County Water District's water demand is diverted from Pilarcitos Reservoir to either San Andreas or Crystal Springs Reservoirs. Pilarcitos Tunnel No.1 conveys water from Pilarcitos Reservoir to Mud Dam No. 1 on upper San Mateo Creek. Water from Pilarcitos and upper San Mateo Creeks is then conveyed through Pilarcitos Tunnel No. 2 to San Andreas Reservoir. Water that passes Mud Dam No. 1 flows downstream to Mud Dam No. 2, and from there it is conveyed to San Andreas Reservoir in San Mateo Creek Tunnel No. 2.

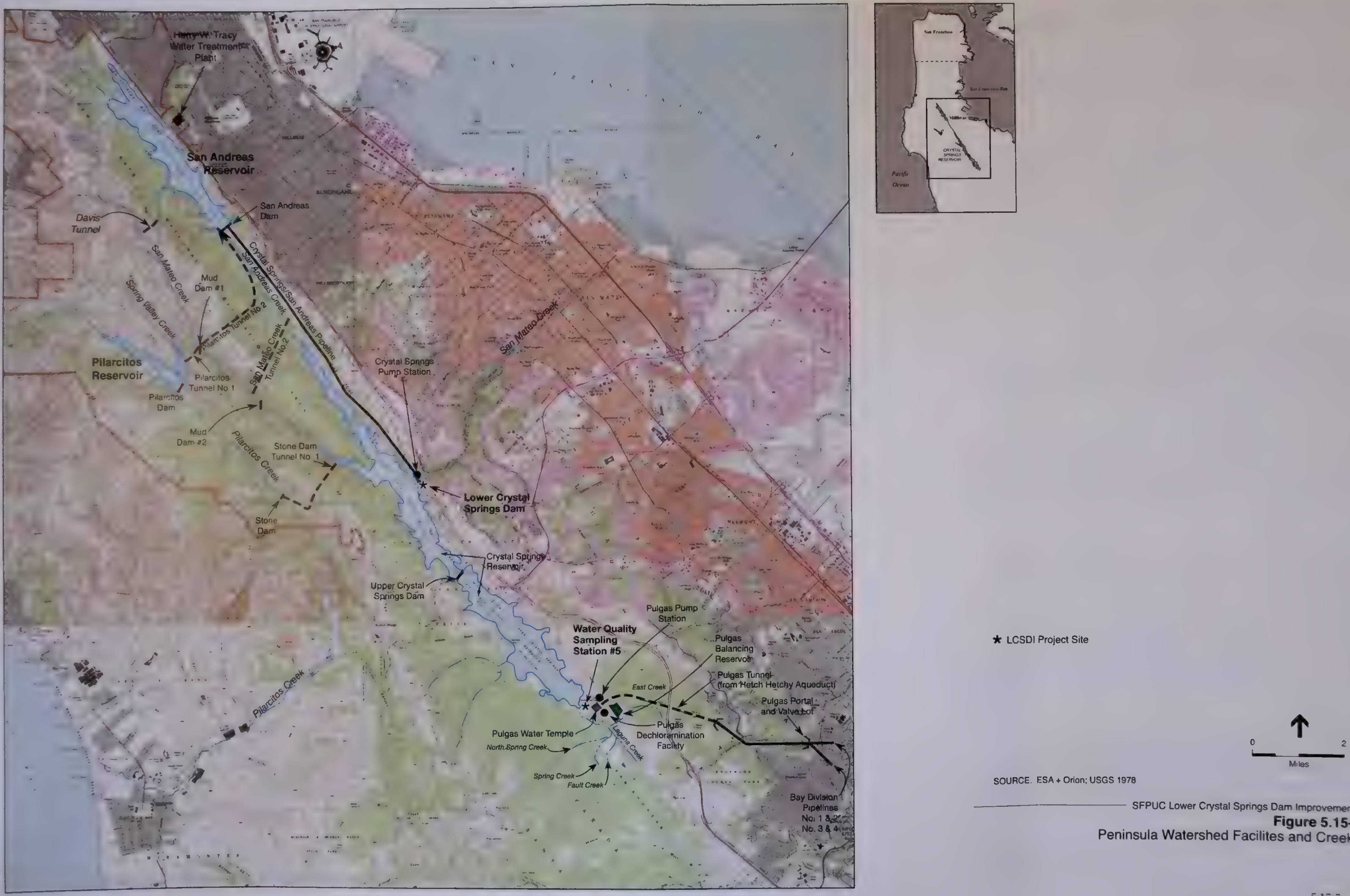


Project Site

ESA + Orion; USGS 1978

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.15-1
Peninsula Watershed Facilites and Creeks



SOURCE. ESA + Orion; USGS 1978

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.15-1
Peninsula Watershed Facilites and Creeks

Coastside County Water District diverts its water supplies from Stone Dam, which is located on Pilarcitos Creek about two miles downstream of Pilarcitos Reservoir. Water reaching Stone Dam that is not needed by Coastside County Water District is conveyed to Crystal Springs Reservoir through Stone Dam Tunnel No. 1. The conveyance systems from Pilarcitos Creek to San Andreas and Crystal Springs Reservoirs operate by gravity. The SFPUC prefers to divert Pilarcitos Creek water to San Andreas Reservoir rather than to Crystal Springs Reservoir because water conveyed to the latter reservoir has to be pumped to San Andreas Reservoir.

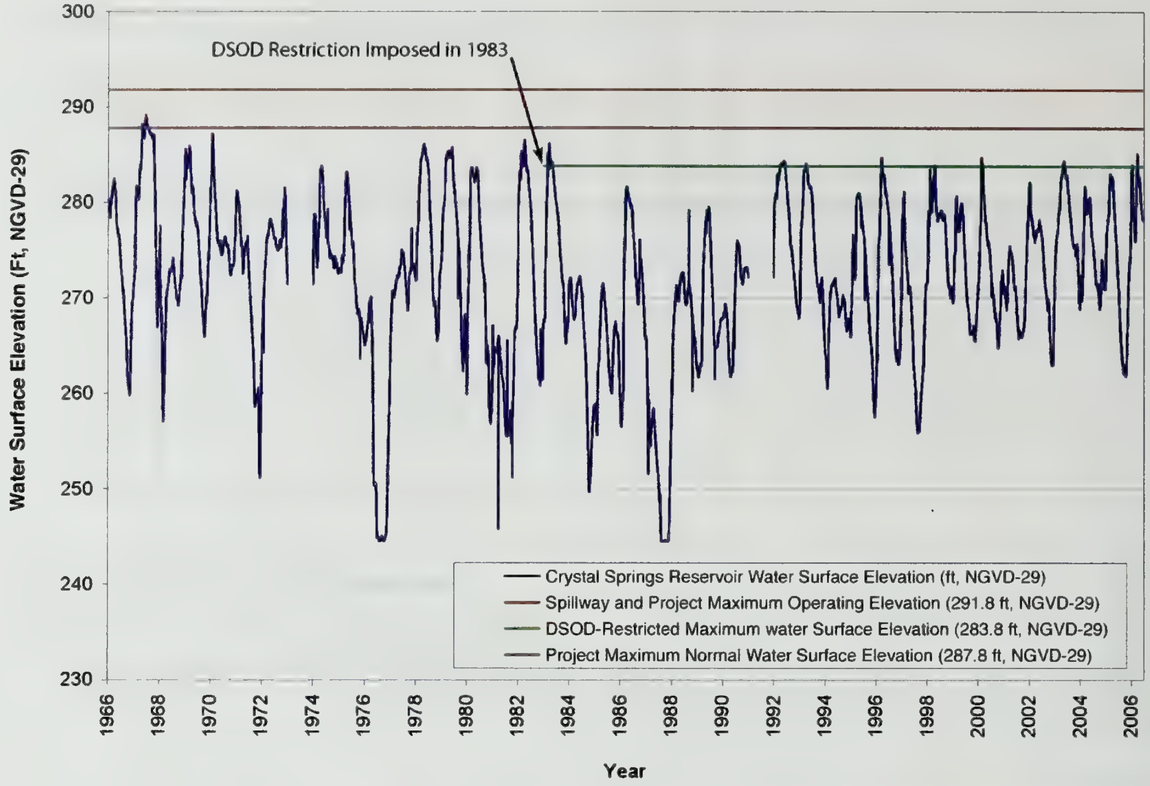
Crystal Springs Reservoir also receives water from the Alameda Creek watershed. The SFPUC operates two reservoirs, Calaveras and San Antonio Reservoirs, and several stream diversions in the Alameda Creek watershed. Water from Calaveras and San Antonio Reservoirs is treated at the Sunol Valley Water Treatment Plant and conveyed west to water users or to Crystal Springs Reservoir.

Crystal Springs Reservoir captures local runoff from upper San Mateo, San Andreas, and Laguna Creeks, but only a fraction of the natural flow in upper San Mateo and San Andreas Creeks reaches Crystal Springs Reservoir. As noted above, some upper San Mateo Creek flow is intercepted and conveyed to San Andreas Reservoir via a system of small dams and tunnels, and most of San Andreas Creek's flow is captured in San Andreas Reservoir.

Operations

The SFPUC's primary operating goals with respect to Crystal Springs Reservoir are to maintain the reservoir as full as possible and to minimize releases of water to lower San Mateo Creek. The SFPUC aims to fill Crystal Springs Reservoir to the DSOD-mandated maximum normal water surface elevation of 283.8 feet by the end of the rainy season in the Bay Area and the snowmelt season in the Sierra Nevada. The water surface elevation typically reaches its maximum in the spring and is then drawn down from June through November, when the stored water is used to meet high summer and early fall water demand. **Figure 5.15-2** shows historical water surface elevations in Crystal Springs Reservoir. The water surface elevation in the reservoir fluctuates considerably in response to water demand, water availability from the Tuolumne River, and maintenance and emergency shutdowns of various water system facilities.

Between November and March, the SFPUC operates the reservoir to maintain a wintertime reservation of approximately 2 billion gallons of capacity so that operators can accommodate floodwater and runoff from the reservoir watershed without releasing or spilling water to lower San Mateo Creek. Although the DSOD limits the maximum normal water surface elevation in Crystal Springs Reservoir to 283.8 feet, it allows the SFPUC to raise the water surface elevation to 287.8 feet by installing stoplogs in the dam spillway when large storms are expected over the watershed. This enables the SFPUC to capture and use water from the storms. Between 1983, when the DSOD limitation was imposed, and 2006, the water surface elevation in the reservoir exceeded the maximum normal water surface elevation nine times.



SOURCE: SFPUC, 2006a.

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.15-2
Crystal Springs Reservoir
Historical Water Surface Elevations

Flooding

Although flood control is not one of the purposes of the LCSD, it is one of its effects. Before the LCSD was built, runoff from storms over the Crystal Springs Reservoir watershed, upstream of the dam, flowed down San Mateo Creek to San Francisco Bay without interruption. Large storms probably caused the creek to overflow its banks and flood adjacent lands. With the dam in place, runoff from the upper watershed rarely reaches lower San Mateo Creek because one of the SFPUC's operating goals is to minimize releases from the reservoir to lower San Mateo Creek as much as possible. The SFPUC typically avoids wintertime releases of water from the reservoir by reducing storage in Crystal Springs Reservoir to accommodate and capture runoff from storms over the watershed. The effect of the reservoir, and the SFPUC's operating protocol for the reservoir, has been to greatly reduce the risk of flooding along the lower reaches of San Mateo Creek as a result of "ordinary storms" over the upper watershed. In this context, "ordinary storms" means storms similar to those that have occurred over the last 100 years. However, local flooding still occurs along the lower creek because urban development has greatly increased the volume of stormwater runoff that can be produced by lands draining to the creek. Urban development also reduces the time it takes for runoff to reach the creek, increasing peak flows.

Flood Insurance Rate Maps (FIRMs) prepared by the Federal Emergency Management Agency (FEMA) indicate that lands along the margins of Crystal Springs Reservoir are "areas of minimal flooding." Lands downstream of the LCSD are largely outside of designated flood areas, with the exception of a parcel in the vicinity of Crystal Springs Road and El Camino Real that lies in the 500-year floodplain. Further downstream, areas east of the Bayshore Freeway (Highway 101) are within the 100-year floodplain, but this is true for all of the lands east of the freeway, not just those adjacent to the creek (FEMA, 1986). The probable cause of this flooding is a high tide combined with a storm surge in San Francisco Bay and rainfall over the land.

Probable Maximum Flood

Because the consequences of dam failure can be severe, the DSOD requires that dams be able pass the Probable Maximum Flood (PMF)—an extremely unlikely event occurring as a result of an extraordinary storm—without damage. The DSOD's determination that the LCSD could not likely pass the PMF without damage led to the imposition of the storage limitations in Crystal Springs Reservoir described above. Removal of the limits on storage is the primary purpose of the proposed project (see the project objectives in Chapter 3). The PMF is the flood produced by the Probable Maximum Precipitation, which the National Oceanic and Atmospheric Administration defines as "the greatest depth of precipitation for a given duration that is physically possible over a given size storm area at a particular geographical location at a certain time of the year" (NOAA, 1999). The PMF is not associated with a particular probability of occurrence; it is much larger than any flood that has occurred during the period of historical record.

The SFPUC prepared a hydraulic evaluation of the PMF at the LCSD and determined that during the PMF, flow could not be accommodated in the existing spillway and would overtop the parapet wall (SFPUC, 2007). It is likely that the existing dam would be damaged or could fail under these conditions.

Dam Failure

Failure of the LCSD during a catastrophic event is considered possible, although highly improbable, and is addressed in regional emergency response planning by San Mateo County and the Association of Bay Area Governments. Studies by the San Mateo County Office of Emergency Services indicate that portions of the communities of San Mateo, Foster City, and Hillsborough would be inundated by water from Crystal Springs Reservoir if the dam failed (San Mateo County, 2007). It is estimated that 4,000 acres of land in the city of San Mateo would be vulnerable to flooding during dam failure (City of San Mateo, 2007). The area includes hospitals, schools, and critical city facilities.

5.15.1.2 Groundwater Hydrology

The Crystal Springs Reservoir watershed is composed primarily of non-water-bearing, igneous[1] metamorphic and sedimentary rocks, together with much smaller amounts of recent water-bearing alluvium and colluvium. Alluvium consists of gravel, sand, clay, and silt deposited by streams, and colluvium consists of rock debris at the base of cliffs or slopes.

Groundwater levels in water-bearing strata around the perimeter of Crystal Springs Reservoir were raised when the reservoir was first filled. Prior to construction of the reservoir, the groundwater table in permeable geologic formations would slope toward San Mateo Creek and its tributaries. With the reservoir in place, the water table in water-bearing strata slopes toward the reservoir.

The water-bearing strata around the perimeter of Crystal Springs Reservoir are primarily located where creeks enter the reservoir. Monitoring of shallow groundwater wells in the alluvial deposits at the north and south ends of Crystal Springs Reservoir demonstrated that groundwater levels rise and fall with water levels in the reservoir. No wells tap the groundwater around the perimeter of Crystal Springs Reservoir.

The LCSD is located in a canyon formed by non-water-bearing rocks, although very small amounts of water seep through fissures in the rock below the dam and in the dam's rock abutments. The reaches of San Mateo Creek below its confluence with Polhemus Creek flow through an area of water-bearing geologic formations. Groundwater underlying the flatlands extending to San Francisco Bay is used for landscape irrigation and industrial water supply and may also supply some domestic wells.

5.15.1.3 Water Quality

Crystal Springs Reservoir

Water quality in Crystal Springs Reservoir reflects that of its sources—local runoff from the Crystal Springs Reservoir watershed, local runoff imported from the Pilarcitos Creek and Alameda watersheds, and water imported from the Tuolumne River. Because the Tuolumne River is the source of about 85 percent of the water in the reservoir, it is the predominant influence on water quality.

Tuolumne River water is of very high quality. The Tuolumne River drainage upstream of Hetch Hetchy Reservoir lies entirely within undeveloped parts of Yosemite National Park. The combination of a high-altitude, granitic drainage basin and minimal human influences results in river and reservoir water that is cold, clear, and free of contaminants. Plant nutrients, such as nitrates and phosphates, are typically below conventional detection limits; in addition, average total dissolved solids concentrations are less than 10 milligrams per liter (mg/L), and average total organic carbon concentrations are less than 2 mg/L. Pathogens (i.e., disease-causing microbes) are almost entirely absent. Because water quality in Hetch Hetchy Reservoir is so good, the U.S. Environmental Protection Agency (U.S. EPA) and the California Department of Health Services—the agencies responsible for regulating drinking water in California—have granted the SFPUC an exemption from filtration requirements for water supplied directly from the reservoir to customers. Water supplied to customers from Hetch Hetchy Reservoir must be disinfected, but does not need to be filtered.

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[1] Produced by fire, great heat, or the action of a volcano; solidified from a molten state. Igneous rock is formed by the cooling and solidification of magma (e.g., granite is an igneous rock).

The quality of the water entering Crystal Springs Reservoir as runoff from the reservoir watershed, from Pilarcitos Creek, and from the Alameda Creek watershed is somewhat lower than the quality of water from the Tuolumne River. As a result, water quality in Crystal Spring Reservoir, while still very good and consistently meeting all regulatory standards for drinking water, is not quite as good as Tuolumne River water alone. The total dissolved solids content of reservoir water averages 82 mg/L, and the total organic carbon content averages 2.2 mg/L. Coliform bacteria at low concentrations can be found in Crystal Springs Reservoir water, indicating that pathogens might be present. Water withdrawn from Crystal Springs Reservoir is not subject to the exemption from filtration requirements and must be disinfected and filtered before it is conveyed to customers.

Although plant nutrient concentrations in Crystal Springs Reservoir water are low, they are sufficient to support the growth of algae in the summer months. Algae in a water source can make water treatment difficult and can cause taste and odor problems with finished water. The sources of the small amounts of plant nutrients in Crystal Springs Reservoir are runoff from the reservoir watershed, fallout from the atmosphere, decomposition of material at the bottom of the reservoir, and incoming water from the Tuolumne River and the Alameda Creek watershed. The amount of nutrients entering the reservoir with incoming water from the Tuolumne River and the Alameda Creek watershed has increased in recent years as a result of water treatment process changes.

The SFPUC must disinfect water before it is conveyed to customers in order to comply with drinking water standards. Water is disinfected at SFPUC facilities in the Sunol Valley in Alameda County before it is conveyed across San Francisco Bay and enters Crystal Springs Reservoir near the Pulgas Water Temple. In 2005, the SFPUC changed the method it uses to disinfect water. Formerly, the SFPUC disinfected water with chlorine gas; it now uses chloramine, a chemical compound that contains both chlorine and ammonia. Ammonia is a form of nitrogen that rapidly decomposes in natural waters to another form of nitrogen called nitrate. Past studies have shown that the growth of algae in Crystal Springs Reservoir is limited by a lack of nitrogen and phosphorus, both of which are plant nutrients; therefore, an increase in the concentrations of either could increase the growth of algae.

Regulations promulgated pursuant to the federal Clean Water Act require that water discharged into any water body classified as "waters of the United States" must be essentially free of chlorine, and Crystal Springs Reservoir is so classified. To comply with these regulations and to minimize the discharge of ammonia into Crystal Springs Reservoir, the SFPUC constructed dechloramination facilities at the same time it constructed chloramination facilities. The dechloramination facilities are located adjacent to the Pulgas Water Temple and remove all chlorine residual and remove most of the nitrogen from water entering Crystal Springs Reservoir. The use of chloramine as a disinfecting agent has resulted in a small increase in the concentration of nitrogen in Crystal Springs Reservoir (SFPUC, 2006b).

Crystal Springs Reservoir stratifies in the summer months; that is, the upper part of the reservoir (the epilimnion) warms, while water in the lower part of the reservoir (the hypolimnion) remains cool. The dividing line between the two zones is called the thermocline and is typically 25 to 50 feet below the surface of the reservoir. As air temperatures drop in the fall and water in the epilimnion cools, the reservoir destratifies or "turns over," and water in the two zones mixes.

The risk of a sudden acceleration in algae growth is greatest in the summer when the reservoir is stratified, and, in the epilimnion, water temperature is at its seasonal maximum and water circulation is at its seasonal minimum. The SFPUC routinely monitors water in Crystal Springs Reservoir to determine whether excessive algal growth and an associated reduction in dissolved oxygen may be occurring.

Lower San Mateo Creek

As noted above, one of the SFPUC's operating goals is to avoid releasing water to San Mateo Creek from Crystal Springs Reservoir to the extent possible. Water is typically only released to the creek during very large and rare storms. The only water in the creek immediately below the dam during dry weather is water that leaks from pipes at the LCSD and the adjacent Crystal Springs Pump Station and seeps around and under the dam. As a result, water quality in the creek immediately below the dam reflects water quality in Crystal Springs Reservoir. During storms, runoff from the Skyline Boulevard Bridge is discharged into the stilling basin at the toe of the dam, causing some deterioration of water quality. Water quality deteriorates further in a downstream direction as wintertime stormwater runoff and summertime wash water and excess landscape irrigation water are discharged to San Mateo Creek from urban storm drains.

The SFPUC sampled water at three locations along lower San Mateo Creek between May 2003 and February 2004. Water quality at the Polhemus Sampling Station, 0.7 mile below the LCSD, was generally good, with a total dissolved solids concentration in the range 124 to 211 mg/L and dissolved oxygen concentrations at or near saturation. Total dissolved solids concentrations at the Gateway Park station, 5.1 miles downstream of the dam and within the urban area, were in the range of 332 to 427 mg/L, except on one occasion when sampling results were affected by a tidal incursion of saltwater from San Francisco Bay. Late summer and fall dissolved oxygen concentrations were at about 50 percent of saturation.

In accordance with the federal Clean Water Act, the State Water Resources Control Board (SWRCB) maintains a list known as the Section 303(d) List of Impaired Water Bodies. San Mateo Creek and all other Bay Area urban creeks are listed as impaired as a result of elevated diazinon concentrations (SWRCB, 2007). Diazinon is an insecticide that has been used on lawns, gardens, agricultural crops, and livestock. In 2004, the U.S. EPA phased out most urban applications of diazinon and, as a result, the use of this pesticide has declined.

5.15.1.4 Geomorphology

The geomorphology of the Crystal Springs Reservoir watershed is defined by the San Andreas fault and its associated steep terrain, northwest-southeast-trending ridges and valleys, and ongoing uplifting and erosional processes. The northern portion of the Crystal Springs Reservoir watershed is steep and rugged. Average hill-slope grades range from 3:1 to 1:1 (horizontal to vertical ratio), while the southern portion of the watershed has average hill-slope grades ranging from 5:1 to 3:1 (San Francisco Planning Department, 2001). The San Mateo Creek and San Andreas Creek watersheds upstream of Crystal Springs Dam are composed of Franciscan Complex sedimentary and metamorphic rocks. Sandstone, shale, chert, and conglomerate marine deposits are predominant southwest of the San Andreas fault. Metamorphosed Franciscan rock, such as serpentine, is widespread northeast of the fault. The Laguna Creek watershed is composed of Eocene marine sedimentary rocks such as fine-grained sandstones and shale (USGS, 1998).

Crystal Springs Reservoir lies within a valley created by the San Andrea fault. San Andreas Creek below San Andreas Reservoir flows southeast along the fault and discharges into Crystal Springs Reservoir. San Mateo Creek flows southeast to Crystal Springs Reservoir between Fifield and Sawyer Ridges, but some of its flow is intercepted at several small dams and conveyed to San Andreas Reservoir. The amount of flow in the reaches of San Andreas and San Mateo Creeks that discharge into Crystal Springs Reservoir has been reduced by the development of the SFPUC regional water system. The creek channels have gradually adjusted to these reduced flow rates over the last 100 years.

Lower San Mateo Creek, downstream of the LCSD, passes through Franciscan Complex sandstone in the foothills of the mountains before flowing across the plain that extends to San Francisco Bay. The plain is underlain by the Colma Formation, a Pleistocene formation of marine and non-marine sands and clays, and the recent Temescal Formation, which is composed primarily of fine-textured sand. For about 1.5 miles below the LCSD, lower San Mateo Creek flows through a steep-sided canyon before emerging on the Bay Plain. In the canyon, the creek has a slope of about 1 percent and flows in a broad channel formed by the much larger creek flows that occurred before the LCSD was built. The creek channel in the canyon is a series of riffles and pools with a bed composed of sand and gravel. Below the canyon, the creek channel has a slope of about 0.25 percent and has a somewhat meandering form, although some reaches have been confined in culverts, straightened, and lined with concrete.

5.15.2 Regulatory Framework

Relevant regulations include the federal Clean Water and Safe Drinking Water Acts, California's Porter-Cologne Water Quality Control Act and Surface Water Treatment Rule, and the SFPUC's own rules and regulations for managing its watersheds.

5.15.2.1 Federal Regulations

Clean Water Act

The Federal Water Pollution Control Act Amendments were passed by Congress and signed by the President in 1972. As amended in 1977, this act became known as the Clean Water Act. The Clean Water Act established the basic structure for regulating discharges of pollutants into the waters of the United States. It gave the U.S. EPA the authority to set ambient water quality standards for surface waters and set standards for municipal and industrial wastewater discharges. The Clean Water Act made it unlawful for any person to discharge any pollutant from a point source into navigable waters unless a permit is obtained. In California, the U.S. EPA delegated much of its authority for implementation of the Clean Water Act to the SWRCB and the nine Regional Water Quality Control Boards (RWQCBs).

Section 303(d) of the Clean Water Act requires states, territories, and authorized tribes to develop a list of water-quality-limited stream segments of waterways. The list includes waters that do not meet ambient water quality standards even after point sources of pollution have been installed with the minimum required levels of pollution control technology.

Section 402 established the National Pollutant Discharge Elimination System (NPDES) and required that a permit be obtained for all point-source discharges. These permits describe the conditions under which a discharge is allowed. Initially, permits were issued primarily for municipal and industrial discharges; however, in 1987, the Clean Water Act was amended and permits began to be issued for discharges of stormwater, including discharges from construction sites.

The SWRCB has adopted a Statewide General Permit for Stormwater Discharges Associated with Construction Activity under the NPDES. The permit is applicable to construction sites of one acre or more. A general permit was adopted because the board determined that issuance of individual NPDES permits to construction sites was impractical. The permit also authorizes the discharge of water other than stormwater from the construction site, provided it does not cause or contribute to a violation of any water quality standard. To be covered by the general permit, an individual contractor must implement the best management practices (BMPs) specified in the general permit. The contractor must prepare a stormwater pollution prevention plan (SWPPP) that describes how the BMPs would be implemented at the construction site, both during construction and after construction is complete.

Section 404 of the Clean Water Act regulates the discharge of dredged or fill material into waters of the United States, including wetlands. Section 404 is administered by the U.S. Army Corps of Engineers (Corps). Please refer to Section 5.13, Biological Resources (Section 5.13.2, Regulatory Framework), for further description of Section 404 requirements.

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA), enacted in 1974 and significantly amended in 1986, was established to protect public health and the quality of drinking water in the United States. The law addresses all waters actually or potentially designated for drinking water use, whether aboveground or underground. The SDWA directed the U.S. EPA to set national standards for drinking water and maximum contaminant levels (MCLs) for a variety of potential drinking water pollutants. The owners or operators of public water systems are required to comply with primary (health-related) MCLs and encouraged to comply with secondary (nuisance- or aesthetics-related) MCLs.

SDWA drinking water standards apply to treated water as it is served to consumers. All surface waters require some form of treatment in order to meet drinking water standards. The degree of treatment depends on the quality of the raw water. The highest quality raw surface waters need only be disinfected before being served to consumers. The SFPUC's Hetch Hetchy water falls into this category. More typically, raw water is treated at a conventional water treatment plant that includes sedimentation, filtration, and disinfection processes. Water from Crystal Springs Reservoir is treated using these processes at the Harry Tracy Water Treatment Plant.

5.15.2.2 State Regulations

Porter-Cologne Water Quality Control Act

Responding to public concern in California, state legislators enacted a law designed to curb water pollution several years before passage of the Federal Water Pollution Control Act Amendments. Many of the ideas contained in the Porter-Cologne Act were incorporated into the Federal Water Pollution Control Act Amendments.

The Porter-Cologne Act of 1969 established the nine RWQCBs and gave them defined responsibilities for water quality management. The act requires the RWQCBs to prepare regional water quality control plans, often referred to as basin plans. The basin plans must identify present and future beneficial uses of California's waters and establish water quality objectives that will protect those uses. California's beneficial use designations and water quality objectives are the functional equivalent of the federal ambient water quality standards.

The SWRCB, together with the San Francisco Bay RWQCB (Region 2), regulates water quality in the project area through regulatory standards and objectives set forth in the *Water Quality Control Plan for the San Francisco Bay Basin* (Basin Plan) (RWQCB, 2007). The Basin Plan lists existing and potential beneficial uses of surface waters in the San Francisco Bay area. The current Basin Plan lists the existing beneficial uses of Crystal Springs Reservoir as: municipal and domestic water supply, non-water-contact recreation, cold freshwater habitat, warm freshwater habitat, fish spawning, wildlife habitat, and rare and endangered species. The existing beneficial uses of San Mateo Creek are listed as: freshwater replenishment, fish spawning, and rare and endangered species. Potential beneficial uses of San Mateo Creek are listed as water-contact recreation, non-water-contact recreation, and cold freshwater fish habitat.

Dam Safety Regulations

The DSOD regulates dams that are 25 feet or more in height or have an impounding capacity of 50 acre-feet or more. The LCSD meets the qualifications for a regulated dam. The principal goal of the regulatory program is to avoid dam failures and consequent loss of life and destruction of property. DSOD staff makes periodic inspections of dams and reservoirs under DSOD jurisdiction to determine their safety and may require that dam owners perform work to safeguard life and property. Construction of any new dam or the repair or alteration of an existing dam requires the approval of the DSOD.

Lake and Streambed Alteration Agreements

Sections 1600 et seq. of the California Fish and Game Code set forth guidelines for the protection and conservation of fish and wildlife, including species habitat. The law requires any person or entity to notify the California Department of Fish and Game (CDFG) before beginning any activity that would substantially modify the bank or bed of a river, stream, or lake. If the CDFG determines that the activity could have a substantial adverse effect on fish or wildlife resources, a Lake or Streambed Alteration Agreement must be obtained from the department. The agreement specifies the conditions under which the activity may proceed.

5.15.2.3 Local Policies

SFPUC Peninsula Watershed Management Plan

The SFPUC has adopted the *Peninsula Watershed Management Plan* (SFPUC, 2002) to provide a policy framework for the SFPUC to make decisions about activities that are appropriate on watershed lands (see Chapter 4, Plans and Policies). The plan considers water quality protection as the first and foremost goal for its watershed lands, and the goals and policies of the plan are organized around the primary goal of water quality protection. As described in Chapter 4, the SFPUC reviews all plans, projects, and activities that occur within the Peninsula watershed—including the LCSDI project—for conformity with the management plan as well as for compliance with environmental codes and regulations.

5.15.3 Impacts and Mitigation Measures

5.15.3.1 Significance Criteria

The City and County of San Francisco has not formally adopted significance standards for surface water hydrology, groundwater hydrology, geomorphology, and water quality, but generally considers that implementation of the proposed project would have a significant impact if it were to:

- Violate any water quality standards or waste discharge requirements;
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table (e.g., the production rate of preexisting nearby wells would drop to a

level that would not support existing land uses or planned land uses for which permits have been granted);

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on or off the site;
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on or off the site;
- Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;
- Otherwise substantially degrade water quality;
- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary of Flood Insurance Rate Map or other authoritative flood hazard delineation map;
- Place within a 100-year flood hazard area structures that would impede or redirect flood flows;
- Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam; or
- Expose people or structures to a significant risk of loss, injury, or death involving inundation by seiche, tsunami, or mudflow.

Due to the nature of the proposed project, this EIR also applies the following additional criteria and considers implementation of the LCSDI project to have a significant effect on hydrology, geomorphology, and water quality if it were to:

- Substantially alter streamflows such that they are outside the range of existing conditions and result in adverse hydrologic effects;
- Substantially impair a water body's ability to support beneficial uses designated by the SWRCB or San Francisco Bay RWQCB (Region 2); or
- Substantially change the topography such that ecological, hydrologic, or aesthetic functions are adversely affected or substantially change any unique geologic or physical features of the site or area.

Due to the nature of the proposed project, there would be no impact related to the following topics for the reasons described below:

> *Alter Drainage Patterns, Substantially Increase the Rate or Amount of Surface Runoff, or Exceed the Capacity of the Stormwater Drainage System*. The LCSDI project would result in changes to existing structures, including the dam, spillway, parapet walls, stilling basin, and Sampling Station #5. With the minor exception of the stilling basin, there would be no change in impervious surface area for any of the structures relative to existing conditions. The proposed enlargement of the stilling basin would result in an increase of about

14,000 square feet of impervious surfaces. However, the enlarged stilling basin would be located at the base of the dam, and there would be no increase in surface runoff. The enlarged stilling basin would capture the same drainage and flows as the existing stilling basin, albeit with improved energy dissipation, and would not result in flooding on or off the site. Therefore, the project would not substantially change the rate or amount of surface runoff, exceed the capacity of any storm drainage systems, or provide additional sources of polluted runoff, and these criteria are not discussed further.

Place Housing or Structures Within a 100-year Flood Hazard Area as Mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map. The LCSDI project would not include the construction of housing. None of the proposed improvements, including the new stilling basin in the San Mateo Creek channel, would be constructed within a designated 100-year flood hazard zone. Therefore, the criteria related to the placement of housing or structures within a 100-year flood hazard zone or obstruction of 100-year flood flows are not applicable to the LCSDI project and are not discussed further.

Cause Inundation by Seiche, Tsunami, or Mudflow. The proposed improvements would be located too far inland to be at risk for tsunami hazards. The project would have no effect on the frequency or probability of seiches in Crystal Springs Reservoir or mudflows from the surrounding mountains. In addition, the proposed improvements would not be susceptible to damage by seiches or mudflows. Therefore, no impacts related to inundation by seiche, tsunami, or mudflow would occur, and this impact is not discussed further.

5.15.3.2 Approach to Analysis

This analysis of potential project effects is divided into two main parts: Construction Impacts and Operational Impacts. Construction effects relate strictly to direct and indirect impacts that could occur during construction activities at the top and toe of the dam during site preparation and clearing, excavation, demolition, dewatering, construction of improvements, and demobilization and site restoration. The potential effects of construction on surface water hydrology, groundwater, water quality, and geomorphology are based on published information regarding the existing conditions and have been evaluated against relevant criteria listed above to determine the significance of each impact.

Operational impacts on hydrology and water quality include the potential long-term effects of the proposed future operations of Crystal Springs Reservoir resulting from the restored capacity of the reservoir and an increase in the maximum normal and average water surface elevations. The potential operational impacts on surface water hydrology, groundwater, water quality, and geomorphology are based on published information regarding existing conditions and information from the SFPUC regarding historical reservoir operation, and have been evaluated against relevant criteria listed above to determine the significance of each impact.

For both construction and operational impacts, changes in water surface elevations at Crystal Springs Reservoir were considered and analyzed. These changes in water levels are important to consider because they could have direct and indirect impacts on other environmental resources (including water quality, vegetation, wildlife, cultural resources, etc.). However, in this EIR, project-related changes in water surface elevations at an existing reservoir are not considered an environmental impact requiring a significance determination. This is, because an existing reservoir is not an element of the natural environment but rather part of an engineered water supply system. Water surface elevations in a reservoir are intended to rise and fall as the engineered system is operated, and thus any project-induced change in the pattern of rising and falling reservoir water levels would not in itself be considered an impact under CEQA requiring a significance determination. The predicted changes in reservoir water levels attributable to the proposed project were used to analyze impacts on water quality, vegetation, wildlife, cultural resources, and other environmental resource areas that could be affected by the altered pattern of rising and falling water in the reservoir, and significance determinations were made for those impacts (and described under those respective resource areas sections in this EIR). This approach is consistent with the one used in the Program Environmental Impact Report (PEIR) on the SFPUC's Water System Improvement Program (WSIP) (San Francisco Planning Department, 2008).

5.15.3.3 Impact Summary

Table 5.15-1 presents a summary of the proposed project's impacts on hydrology and water quality.

TABLE 5.15-1
SUMMARY OF IMPACTS – HYDROLOGY AND WATER QUALITY

	Significance Determination	
Impact	**LCSD Site**	**Sampling Station Site**
Impact HY-1: Construction-related impacts on flow along lower San Mateo Creek.	LS	N/A
Impact HY-2: Construction-related impacts on groundwater levels in the vicinity of Crystal Springs Reservoir and the LCSD.	LS	N/A
Impact HY-3: Construction-related impacts on water quality in Crystal Springs Reservoir and along lower San Mateo Creek.	PSM	PSM
Impact HY-4: Construction-related impacts on the geomorphology along San Mateo, San Andreas, and Laguna Creeks.	LS	N/A
Impact HY-5: Long-term effects on flow along lower San Mateo Creek.	LS	N/A
Impact HY-6: Increased flood hazards along lower San Mateo Creek during project operations.	B	N/A
Impact HY-7: Long-term effects on groundwater levels and quality in the vicinity of Crystal Springs Reservoir and the LCSD.	LS	N/A
Impact HY-8: Long-term impacts on water quality in San Mateo, San Andreas, and Laguna Creeks, and Crystal Springs Reservoir.	LS	N/A
Impact HY-9: Operational effects on the geomorphology along San Mateo, San Andreas, and Laguna Creeks.	LS	N/A
Impact C-HY: Cumulative impacts on water quality and hydrology.	LS	N/A

B = Beneficial impact
N/A = Not Applicable or no impact
LS = Less than Significant impact, no mitigation required
SM = Significant impact, can be Mitigated to less than significant
PSM = Potentially Significant impact, can be Mitigated to less than significant
SU = Significant Unavoidable impact
PSU = Potentially Significant Unavoidable impact

5.15.3.4 Construction Impacts

Construction Effects on Reservoir Levels

Construction of the proposed project would affect water levels in Crystal Springs Reservoir. The elevation of the existing spillway at the LCSD is 283.8 feet. At the beginning of the rainy season, the SFPUC reduces storage in Crystal Springs Reservoir by about 2 billion gallons below the spillway level in order to accommodate runoff from storms over the watershed without spilling water to San Mateo Creek. In late winter or early spring, the SFPUC eliminates this floodwater reservation and increases storage in the reservoir by raising the water level to the spillway elevation. In 2011, when construction of the project occurs, the SFPUC would keep the water surface elevation several feet below the spillway elevation through the major construction period from March to November. The lower water level would facilitate construction on top of the dam and would guard against the remote possibility of an unseasonable summer or fall storm causing water to overtop the spillway during construction. It is expected that the maximum water surface elevation in the reservoir in the year construction occurred would be 2 or 3 feet below its typical value.

Impact HY-1: Construction-related impacts on flow along lower San Mateo Creek.

Lower Crystal Springs Dam Vicinity

Construction of the proposed project could affect dry-season flow in lower San Mateo Creek because pipe leakage and seepage around the dam are affected by hydrostatic pressure. Hydrostatic pressure on the dam and its rock abutments and in the piping system at the dam is produced by the weight of water behind the dam. Hydrostatic pressure increases and decreases as the water level in Crystal Springs Reservoir rises and falls and is proportional to the difference between the elevation of the reservoir water surface and the elevation of the groundwater table at the toe of the dam. Because the SFPUC would keep the maximum water surface elevation in the reservoir during the construction period 2 to 3 feet below its typical maximum value, hydrostatic pressure would be reduced compared to its typical value for several months in the late spring and early summer. This could reduce the rate of leakage by 0 to 5 percent. Thus, the rate of leakage could decrease from its current value of 0.6 cfs to 0.57 cfs.

The rate of seepage would not only be affected by the lowered maximum water surface elevation but also by dewatering operations for the new stilling basin at the toe of the LCSD. Dewatering the excavation for the stilling basin would lower the water table in the ground at the toe of the dam by up to 15 feet. The net effect of lowering the maximum water surface elevation in the reservoir and lowering the groundwater table at the toe of the dam would be to increase maximum hydrostatic pressure, which could increase seepage by 0 to 10 percent. Thus, the rate seepage could increase from its current value of 0.1 cfs to 0.11 cfs.

Dewatering of the excavation for the new stilling basin would occur in two phases. In the initial phase, the creek channel between Pool 1 and Pool 2 would be blocked and water would be pumped out of Pool 1, conveyed to a settling tank or other treatment device, and discharged to

San Mateo Creek downstream of the construction zone in compliance with the turbidity discharge limits of the RWQCB. Water would be pumped from Pool 1 in manner protective of sensitive fish and other species, including rescue and relocation of fish to a suitable downstream location (for further information, see Chapter 3, Project Description, Section 3.6.4). Similarly, discharge from the treatment system during pool dewatering would occur in a manner to avoid erosion at the discharge point.

The surface area of Pool 1 is about 609 square feet. Assuming an average water depth of 4 feet, the volume of water that would be pumped from the pond would be about 18,000 gallons. Assuming a pumping rate of 20 gallons per minute (equivalent to 0.04 cfs), the pond would be emptied in about 15 hours, or two day shifts. During Phase 1 of the operation, dewatering activities would increase the flow in lower San Mateo Creek from its current value of 0.6 cfs to 0.64 cfs.

Once Pool 1 is empty, it would be filled with clean engineered fill material for construction of the temporary access road, and excavation of the stilling basin would begin. The sides of the excavation pit for the new stilling basin would be shored during construction, and all groundwater that surfaces in the stilling basin excavation sites (e.g., through weep holes in the shoring) would be pumped and treated prior to discharge to San Mateo Creek. Dewatering would continue for the duration of construction of the stilling basin. The rate at which water is pumped from the excavation pit and discharged to the creek would be similar to the estimated rate of seepage (0.11 cfs), although it might be elevated somewhat by water that enters the excavation pit after infiltrating through the fill material in Pool 1.

Under the existing condition, dry-weather flow in the creek immediately downstream of the LCSD's stilling basin consists of about 0.7 cfs of leakage from pipes at the dam and seepage around and under the dam. During the construction period, there would be a slight decrease in leakage attributable to the lowered reservoir level, and a slight increase in seepage during the dewatering operation. The net effect of project construction on lower San Mateo Creek's dry-season flow regime would be negligible.

Construction of the project's major elements is scheduled for the dry season, but some construction activities would occur at the beginning and end of the rainy season. Almost all of the stormwater runoff that enters lower San Mateo Creek immediately below the LCSD originates from I-280 and discharges through a pipe that descends the south abutment of the dam into the stilling basin. During the construction period, the pipe would be relocated to discharge to the creek downstream of the construction zone. There would be no change in the volume of the discharge, and so construction of the proposed project would not affect the creek's wet-weather flow regime.

Flow in lower San Mateo Creek is occasionally increased by controlled releases and uncontrolled spills from the LCSD. The uncontrolled spills are extremely rare and occur only when there are very large and unanticipated winter storms over the Crystal Springs Reservoir watershed; no uncontrolled spills to San Mateo Creek over the top of the dam through the spillway have occurred in the past 25 years. Most controlled releases occur in similar circumstances; in the last 25 years, the SFPUC has made three to four controlled releases to San Mateo Creek through the valves below the dam. Because most construction activities are scheduled for the dry season and the water level in the reservoir would be kept lower during construction, it is virtually inconceivable that an uncontrolled spill or a storm-related controlled release would occur during the construction period. Controlled releases are also made to test valves at the dam and the Crystal Springs Pump Station. No valve testing would be performed during the construction period. Thus, during the year that construction takes place, there would be even less chance of a controlled release or uncontrolled spill than in a typical year under the existing condition. Construction of the proposed project would not substantially change the flow regime of lower San Mateo Creek. Therefore, project construction would have a *less-than-significant* impact on flow in lower San Mateo Creek, and no mitigation is required.

Sampling Station #5 Vicinity

The Sampling Station #5 vicinity drains to Upper Crystal Springs Reservoir. Construction activities would be confined to the dry season and would have no impact on drainage to the reservoir. Flows in the Pulgas Discharge Channel would continue as part of normal systemwide operations throughout the construction period the same as under existing conditions in order to maintain delivery to customers. Thus, construction-related impacts on flow in downstream water bodies are *not applicable* to this site.

Impact HY-2: Construction-related impacts on groundwater levels in the vicinity of Crystal Springs Reservoir and the LCSD.

Lower Crystal Springs Dam Vicinity

Construction of the proposed project could affect groundwater levels in the vicinity of Crystal Springs Reservoir and the LCSD. As noted above, the water surface elevation in Crystal Springs Reservoir during part of the construction period would be 2 or 3 feet lower than it would be under typical preconstruction baseline conditions. As a consequence, the groundwater levels in the lands around the reservoir perimeter would be 2 or 3 feet lower than they would be in the preconstruction baseline condition. The effects of the lowered reservoir water surface elevation on groundwater levels would extend for a few feet to several hundred feet from the reservoir perimeter, depending on topography.

Hydrostatic pressure in fissures in the rock strata that form the abutments of the LCSD would decrease as a result of the lowered water surface elevation in Crystal Springs Reservoir. However, the dewatering operation for stilling basin construction would temporarily lower groundwater levels, which would result in an increase in maximum hydrostatic pressure at the toe of the dam. The net result would be a slight increase in hydrostatic pressure and a slight increase in groundwater seepage under and around the dam.

During construction, groundwater levels near the top of the dam would be lowered by 2 or 3 feet, and groundwater levels near the toe of the dam would be lowered by up to 15 feet. Lowering the water table at the toe of the dam would occur only at the stilling basin site and in its immediate vicinity and would not extend beyond the construction zone.

Construction of the proposed project would not substantially deplete groundwater supplies or affect the productivity of any wells in the project vicinity. There are no wells around the perimeter of Crystal Springs Reservoir. Therefore, project construction would have a *less-than-significant* impact on groundwater levels in the vicinity of Crystal Springs Reservoir and the LCSD. No mitigation is required.

Sampling Station #5 Vicinity

Construction activities at Sampling Station #5 vicinity would not require dewatering nor the lowering of reservoir levels. Thus, *no impact* related to groundwater levels in the vicinity of Crystal Springs Reservoir and the LCSD would result from project construction at this site.

Impact HY-3: Construction-related impacts on water quality in Crystal Springs Reservoir and along lower San Mateo Creek.

Construction of the proposed project could affect water quality in Crystal Springs Reservoir and in lower San Mateo Creek, downstream of the LCSD. Construction activities would not affect water quality in upstream areas, including upper San Mateo, San Andreas, and Laguna Creeks.

Lower Crystal Springs Dam Vicinity

Lower Crystal Springs Reservoir. Construction of the proposed project could affect water quality in Lower Crystal Springs Reservoir in two ways: (1) demolition and construction work on the top of the LCSD could affect water quality in the reservoir if broken concrete, fresh concrete, concrete dust, or other construction materials were to fall or be released into the reservoir; and (2) oil, grease, and other hazardous construction materials could be accidentally released to the reservoir as a result of construction equipment and activities associated with use of barges for construction. Although the turbidity and pH of water in the reservoir in the immediate vicinity of the dam could be affected, the amount of dilution available in the reservoir would prevent any substantial changes in water quality. In addition, as described in Chapter 3, Project Description, if barges are used for construction, the barges and any motor boat (i.e., non-SFPUC watercraft) would be steam-cleaned prior to placement in the reservoir which would minimize water quality impacts associated with use of barges. However, due to the designated beneficial uses of Crystal Springs Reservoir, which include municipal and domestic water supply and rare and endangered species, these construction-related impacts on reservoir water quality would be *potentially significant*. With implementation of Mitigation Measure M-HY-3 (Preparation and Implementation of a SWPPP), which specifies the preparation of a SWPPP that includes site-specific BMPs to be implemented during construction to protect water quality in receiving water bodies, potential construction-related impacts on water quality in Lower Crystal Springs Reservoir would be reduced to a less-than-significant level.

Lower San Mateo Creek. Construction of the proposed project could affect water quality along lower San Mateo Creek immediately below the dam in three ways: (1) stormwater runoff from the construction site could increase soil erosion and sedimentation in the creek channel; (2) construction activities could result in the accidental release of hazardous construction materials into the creek channel; and (3) discharges of water produced from dewatering activities in the vicinity the stilling basin site could be high in turbidity, thereby affecting the quality of receiving waters.

Earthwork that would occur as part of the proposed improvements at the stilling basin include site clearing, excavation, soil stockpiling, grading, and installing a temporary access road, and backfilling. During construction, exposed soils from excavated areas and stockpiled soil could be transported by wind or water and, if not properly managed, could accumulate in San Mateo Creek, potentially resulting in increased sediment load and adversely affecting water quality. The major ground-disturbing construction activities within the San Mateo Creek channel are scheduled for the dry season, which would minimize the exposure of excavated areas, soil stockpiles, as well as other potential contaminants to the erosive forces of precipitation and stormwater. However, the construction schedule indicates that some construction activities would continue into the early part of the rainy season. Even by scheduling most ground-disturbing activities in the dry season, the effects of construction on water quality in lower San Mateo Creek would be potentially significant due to the proximity of construction activities to the creek and the creek's beneficial use as habitat for rare and endangered species.

Construction activities can also generate hazardous waste products such as adhesives, solvents, and drilling and petroleum lubricants that, if not managed appropriately, can adhere to soil particles, become mobilized by rain or runoff, and contribute to nonpoint-source pollution. Discharges of hazardous construction materials to San Mateo Creek during project construction would be a potentially significant impact.

As described above, the area around the stilling basin would be dewatered to enable the contractor to create a dry work area for construction activities. Water produced during dewatering would be discharged following treatment (probably in a settling tank) to lower San Mateo Creek downstream of the construction site, after it has been tested and shown to meet all applicable discharge requirements.

Water produced during dewatering would be expected to contain elevated concentrations of suspended material. All water from the dewatering operation would be pumped to a settling tank or other treatment device. If a tank is used, water would be retained in the tank for sufficient time to allow sand and most silt to settle out. Clarified water from the top of the tank would be released to the creek after testing to make sure it complies with discharge requirements. The discharge would likely contain some residual fine silt that does not settle well and would be carried downstream in the creek. The silt particles would be inorganic in nature and similar in character to particles eroded from the creek bed and banks during high flows. The discharge could increase water turbidity somewhat, but would not be expected to substantially impair water quality in lower San Mateo Creek.

Due to the designated beneficial uses of San Mateo Creek, which include freshwater habitat for fish spawning and habitat for rare and endangered species, impacts on water quality from increased soil erosion and sedimentation, the accidental release of construction materials into San Mateo Creek, and dewatering discharges would be considered *potentially significant*. However, with implementation of Mitigation Measure M-HY-3 (Preparation and Implementation of a SWPPP), which specifies preparation of a SWPPP that includes site-specific BMPs to be implemented during construction to protect water quality in receiving water bodies, including provisions for dewatering activities, potential construction-related impacts on water quality would be reduced to a less-than-significant level.

Sampling Station #5 Vicinity. Construction activities at Sampling Station #5 could affect water quality in Upper Crystal Springs Reservoir. Construction would be scheduled for the dry season, but it is possible that an unseasonable storm could cause runoff from the construction site to enter the reservoir. Although the large amount of dilution available in the reservoir would prevent any substantial changes in water quality, due to the designated beneficial uses of Crystal Springs Reservoir and its proximity to the construction site, construction-related impacts on reservoir water quality would be *potentially significant*. With implementation of Mitigation Measure M-HY-3 (Preparation and Implementation of a SWPPP), which specifies preparation of a SWPPP that includes site-specific BMPs to be implemented during construction to protect water quality in receiving water bodies, potential construction-related impacts on water quality in Crystal Springs Reservoir would be reduced to a less-than-significant level.

Impact HY-4: Construction-related impacts on the geomorphology along San Mateo, San Andreas, and Laguna Creeks.

Lower Crystal Springs Dam Vicinity

Construction of the proposed project could affect the geomorphology of upper and lower San Mateo Creek and San Andreas and Laguna Creeks because portions of the creeks that would be submerged in the reservoir under the baseline condition would be exposed to erosive forces associated with a flowing stream during part of the construction period.

San Andreas, Laguna, and Upper San Mateo Creeks. As noted above, the water surface elevation in Crystal Springs Reservoir during part of the construction period would be 2 or 3 feet lower than it would be under typical preconstruction baseline conditions. As a consequence, a few hundred feet of the channels of upper San Mateo and Laguna Creeks that would otherwise be inundated would be free-flowing. San Andreas Creek would not be affected by the lower reservoir levels because it drains to Tracy Lake, a small seasonal water body at the extreme northern end of Lower Crystal Springs Reservoir. Tracy Lake is connected to Lower Crystal Springs Reservoir by a culvert equipped with a gate that is normally closed.

During construction, reservoir water levels would be lower than they are under the existing condition for a few months and this could cause some temporary, minor alteration of channel characteristics in a few hundred feet of Laguna and upper San Mateo Creeks. As noted earlier, during fall and early winter, the SFPUC lowers the water surface elevation in Crystal Springs Reservoir so that runoff from winter storms can be accommodated in the reservoir. The SFPUC typically allows the water surface elevation to rise in the late winter and spring to its maximum normal value as the frequency and magnitude of storms declines. The water surface elevation drops in the summer and early fall, as water demand reaches its seasonal maximum. In the year that construction occurs, the SFPUC would limit the rise in water surface elevation so that it remains two or three feet below its normal maximum value. Between March and June in the year of construction, the water surface elevation in the reservoir would likely be a few feet lower than it is under the existing condition. However, the effects would be minor because streamflow would likely be low during most of the time that water levels would be depressed relative to the existing condition. The typical critical channel-forming flow that would be expected every one to two years would be unlikely to occur between March and June. Furthermore, channel geomorphology tends to reflect long-term changes in flow over decades rather than changes of short duration, and any changes associated with the short-term lowering of the reservoir during construction would be within the same range of fluctuation that occurs under existing reservoir operations.

Construction of the proposed project would not substantially affect drainage patterns or channel form along San Andreas, Laguna, or upper San Mateo Creeks. Thus, project construction would have a *less-than-significant* impact on the geomorphology of San Andreas, Laguna, and upper San Mateo Creeks. No mitigation is required.

Lower San Mateo Creek. As described in Impact HY-1, flow in lower San Mateo Creek immediately below the stilling basin construction zone could increase slightly for up to three months as a result of discharges from dewatering activities. Any increase in flow would be too small and too short in duration to alter stream channel characteristics. Furthermore, the creek channel downstream of the LCSD is resistant to erosion during low flows because much the fine material in the channel is washed out by the annual large flows from the I-280 storm drain. Channel geomorphology tends to reflect long-term changes in flow over decades rather than flow changes of short duration.

Construction of the proposed project would not substantially affect drainage patterns or channel form along lower San Mateo Creek. Thus, project construction would have a *less than significant* impact on the geomorphology of lower San Mateo Creek. No mitigation is necessary.

Sampling Station #5 Vicinity

The Sampling Station #5 vicinity drains to Upper Crystal Springs Reservoir and construction activities at this site would have no effect on the geomorphology along San Andreas, Laguna, and San Mateo Creeks. This impact is *not applicable* to this site.

5.15.3.5 Operational Impacts

Operational Effects on Reservoir Levels

This discussion is used in the analyses of operational impacts on aesthetics and biological resources presented in Sections 5.3.3.5 and 5.13.3.5 of this EIR, respectively. It includes a detailed explanation of the methodology used to determine changes in long-term seasonal water surface elevations and associated changes in inundation frequencies at various contour elevations. The SFPUC's operational goals for Crystal Springs Reservoir after completion of the proposed project would be the same as the current goals—to keep the reservoir as full as possible and minimize releases to San Mateo Creek—but actual water levels in the reservoir would be different from those occurring under the existing condition (on average, higher by a few feet). As they do currently, future operating protocols would allow the water surface elevations to occasionally rise above their normal maximum values in order to capture water from late spring storms over the reservoir watershed (Briggs, 2009). Different analytical methods were used to analyze the effect of the proposed project on long-term seasonal water surface elevations in Crystal Springs Reservoir and the short-term exceedences above the normal maximum water surface elevation of 287.8 feet. The methods and results are described below.

Long-Term Seasonal Water Surface Elevations

Methods. Section 15125(a) of the CEQA Guidelines states that, "An EIR must include a description of environmental conditions in the vicinity of the project, as they existed at the time the notice of preparation is published." Furthermore, the CEQA Guidelines state that, "The environmental setting will normally constitute the baseline physical conditions by which a Lead Agency determines whether an impact is significant."

Establishing the existing or baseline condition for a water supply reservoir subject to improvements is complicated by the fact that storage and water surface elevations in a reservoir are dynamic, varying seasonally and from year-to-year in response to hydrological conditions. Establishing the baseline as a "snapshot" of conditions on the day the notice of preparation was published would consequently distort the environmental impact assessment. Two methods are available to characterize the baseline conditions—use of historical data and use of a mathematical simulation model. The two methods and their limitations are described below.

The SFPUC has maintained records of storage and water surface elevations in Crystal Springs Reservoir for many years. These historical records were evaluated for their potential to characterize baseline conditions in the reservoir. Under this methodology, monthly average water surface elevations could be calculated and the maximum and minimum water surface elevations abstracted from the records. Limitations associated with the use of the historical records to establish the baseline condition for the reservoir arise because circumstances have changed over the period of record. Water demand has increased gradually over time so that the older records do not reflect current levels of demand. Also, operating goals and practices have changed in response to the DSOD restrictions imposed on Crystal Springs and Calaveras Reservoirs in 1983 and 2002, respectively, and to a narrowing margin between available water supplies and increasing demand. Average values calculated over a long historical period when demand and operating practices are changing do not accurately portray the existing or baseline condition.

The SFPUC uses a mathematical model, the Hetch Hetchy/Local Simulation Model (HH/LSM),[2] to simulate the operations of its regional water system. The model enables the SFPUC to examine the consequences of changes in operations or facility improvements on the conveyance and storage of water. HH/LSM is similar to the models used by other large water purveyors in the United States to depict their water system operations and to plan for system improvements. The HH/LSM can be manipulated to characterize various operational scenarios and used to simulate system operations over the course of the 82-year (984-month) sequential hydrologic period (from 1920 to 2002) for which there is historical hydrologic data. The HH/LSM was used to establish baseline conditions and with-project conditions for the WSIP PEIR. The model predicts storage in the SFPUC's reservoirs over the 82-year period based on a set of water system operating protocols and historical hydrologic records: it does not directly rely on historical data from records of reservoir operations.

Mathematical models are a useful but somewhat limited analytical tool because they inevitably present a simplified version of reality. They are best used to compare alternatives rather than to predict absolute values. For example, the HH/LSM predicts that under the hydrologic conditions prevailing in March 1982 the water surface elevation in Crystal Springs Reservoir without the improvements (baseline condition) would be 277 feet. With the improvements, the water surface elevation in the reservoir in the same month would be 285 feet. A user of the model can be more confident of the accuracy of the predicted 8-foot difference between the baseline and proposed project conditions than he/she can be of the predicted absolute water surface elevations. This is because any inaccuracies in the model tend to cancel out when the model is used for comparative purposes. The analysis would be subject to greater inaccuracies if absolute values of water surface elevations predicted using the HH/LSM for the with-project future condition were compared to water surface elevations for the baseline condition derived from historical data.

Although both methods for characterizing baseline conditions have some limitations, a mathematical model is usually preferred because it can be used to characterize both baseline and with-project conditions. The same method is used to characterize the two scenarios, and model results are used to compare alternatives rather than to predict absolute values. As noted above, models perform better in comparative analyses than in predicting absolute values, which is why the HH/LSM was used in the analyses for the WSIP PEIR.

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[2] The HH/LSM is a water supply planning model developed and used by the SFPUC to assist in the evaluation of its water system operations. It is the best available tool for depicting the overall regional water system operations under a range of conditions. Further description of the HH/LSM is contained in the Final PEIR on the WSIP (San Francisco Planning Department, 2008).

When the HH/LSM was used to compare the baseline and with-project scenarios, it became apparent that the model was underestimating water-level fluctuations in both scenarios. A comparison of recent measured historical water surface elevations and water surface elevations predicted by the model under baseline conditions showed large differences. The measured maximum monthly water surface elevations agreed fairly well with model predictions, but the measured minimum monthly water surface elevations were much lower than the model predictions. While some discrepancies between measured values and model predictions are expected, the differences noted were too great to be ignored.

The differences were caused by the fact that the HH/LSM assumes a level of perfection in water system operations that is not achievable in practice. The model contains operational assumptions regarding, for example, SPFUC's ability to convey Hetch Hetchy aqueduct water to the Peninsula for storage in Crystal Springs Reservoir. In fact, almost every year there are circumstances (e.g., equipment outages, emergency maintenance, etc.) that prevent the SFPUC from moving water to Crystal Springs Reservoir as efficiently as the model predicts. As a result, storage and water surface elevations in the reservoir, particularly in the late summer and fall, are lower than those predicted by the model.

Because of the differences between measured data and model predictions, it was determined that this EIR analysis would employ a hybrid analytical methodology that uses both historical data from records of reservoir operation and HH/LSM results rather than relying exclusively on the HH/LSM. This method takes advantage of the long period of historical hydrologic record provided by the model (1920–2002), but adjusts the model results using recent historical records of reservoir operation. The SFPUC examined records of Crystal Springs Reservoir operations and concluded that the years 2002 to 2008 best represent typical current operations. Historical data from 2002 to 2008 were used to adjust and make the HH/LSM model results more realistic. Historical data from before 2002 is not representative of current operations because water demand was less, and various events occurred that resulted in atypical reservoir operations (Cameron, 2009) (see Appendix M for more detail).

Table 5.15-2 illustrates how the model results were adjusted. Storage in Crystal Springs Reservoir as predicted by the model under baseline conditions and storage as measured during the period from 2002 to 2008 are shown in the table. "Scaling" factors (mathematical adjustments) were calculated by dividing measured values by values predicted by the model. The monthly average scaling factors were then used to adjust the model results for both the baseline and with-project scenarios. A complete explanation of the method is contained in Appendix M. The hybrid analytical methodology was used to estimate baseline and with-project water surface elevations in this hydrology analysis. The estimated water surface elevations were used in the assessment of impacts on aesthetics, hydrology, water quality, geomorphology, terrestrial biology, wetlands, and fisheries (see Sections 5.3 and 5.13 for a discussion of impacts on aesthetics and biological resources, respectively).

TABLE 5.15-2
SCALING FACTORS USED TO ADJUST HH/LSM DATA FOR CRYSTAL SPRINGS RESERVOIR OPERATIONS

	Storage in Crystal Springs Reservoir						Scaling Factors		
	Predicted Using Model for Baseline Condition			Measured 2000–2008					
	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
Oct	16,217	16,535	15,010	13,238	15,612	10,514	0.82	0.94	0.70
Nov	15,867	16,520	15,117	14,291	16,601	11,756	0.90	1.00	0.78
Dec	16,358	18,520	15,355	15,085	17,209	12,512	0.92	0.93	0.81
Jan	17,012	18,613	15,547	16,483	18,321	14,042	0.97	0.98	0.90
Feb	17,199	20,507[a]	15,221	16,491	17,368	15,634	0.96	0.85[a]	1.03
Mar	16,407	18,520	14,460	17,065	18,428	15,484	1.04	1.00	1.07
Apr	17,203	18,520	15,000	16,934	18,676	14,542	0.98	1.01	0.97
May	17,074	18,520	15,000	16,459	19,114	13,966	0.96	1.03	0.93
Jun	16,179	18,520	15,035	15,691	18,570	12,976	0.97	1.00	0.86
Jul	15,628	18,391	15,000	14,825	17,774	11,794	0.95	0.97	0.79
Aug	15,324	17,520	15,000	13,854	16,728	10,257	0.90	0.95	0.68
Sep	15,854	16,800	15,365	13,293	15,881	9,722	0.84	0.95	0.63
Annual	16,360	20,507	14,460	15,309	19,114	9,722	N/A	N/A	N/A

[a] The storage predicted by the model under February 1998 conditions is incorrect and distorts the maximum storage levels. If the anomalous result is replaced with a more realistic value, the corresponding scaling factor becomes 0.94. The modified scaling factor was used in the analysis.

N/A = Not Applicable

The water surface elevations predicted using the HH/LSM and adjusted using monthly average scaling factors derived from historical reservoir operations data may somewhat underestimate the degree to which water levels in Crystal Springs Reservoir fluctuate under both the baseline and with-project scenarios because of an unavoidable shortcoming in the analytical method. This shortcoming results from the fact that the scaling factors are derived from monthly average data, and these factors are so derived because there is no practical way to obtain them from monthly maximum and minimum data. As a result, the hybrid analytical methodology may at times underestimate the extent of reservoir drawdown. However, because any underestimation of water surface elevation fluctuations affects both the baseline and with-project scenarios, the effects of the underestimation on wetland losses are expected to be small. The approach is appropriate for CEQA analysis because it is conservative; it is conservative because greater water-level fluctuations are associated with lesser wetland losses, and thus the wetland losses predicted using the method may be slightly greater than actual losses. Greater water-level fluctuations are associated with lesser wetland losses because greater water level fluctuations would result in a broader band of land around the reservoir that could be is suitable for wetland vegetation.

Results. With the proposed project in place, the SFPUC's primary operating goals for Crystal Springs Reservoir would remain the same as the current goals—to keep the reservoir as full as possible and minimize releases to San Mateo Creek. Actual operations would differ from current operations because of the restoration of the historical reservoir capacity and the 4 foot increase in maximum normal water surface elevation. The HH/LSM and historical data were used to estimate future water surface elevations in the reservoir with implementation of the proposed project.

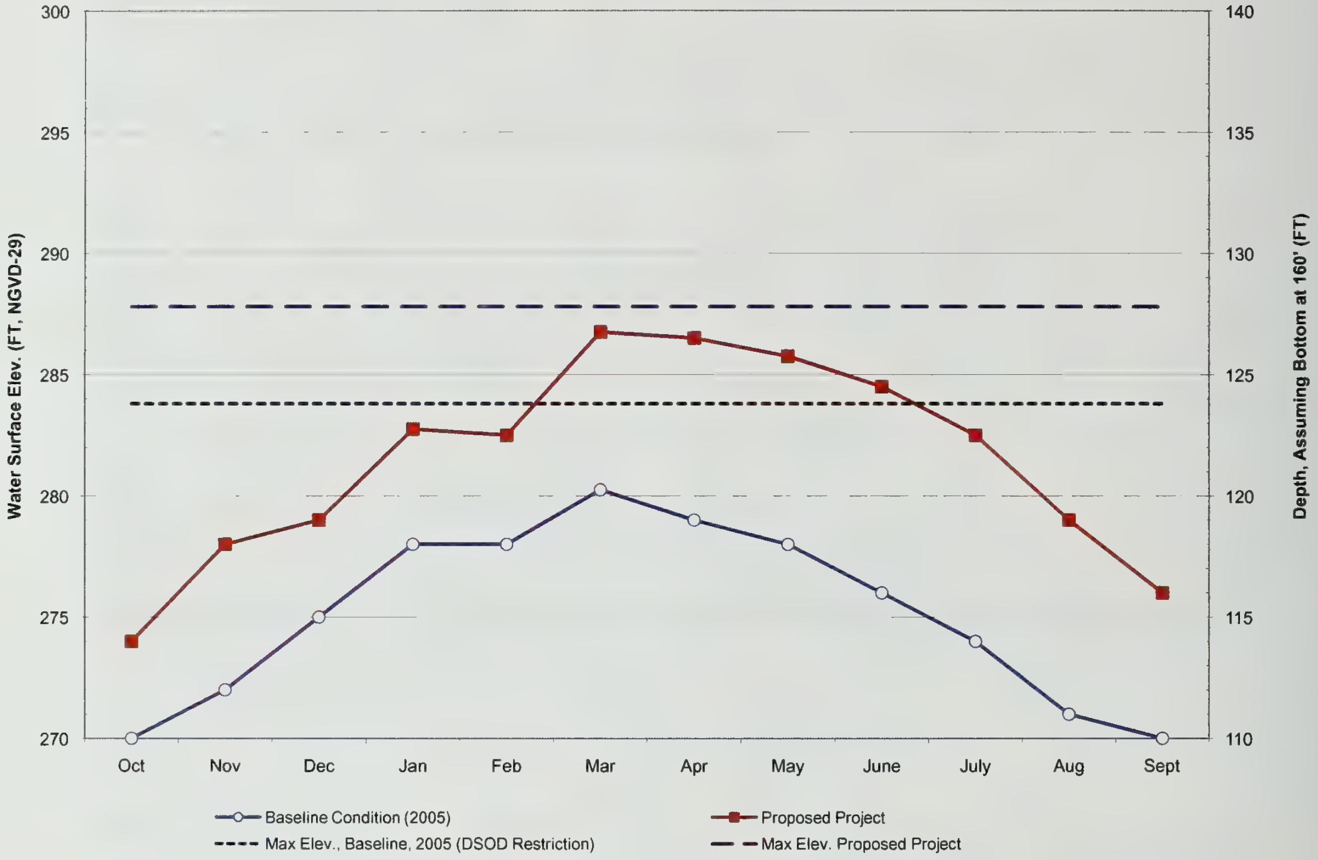
Figure 5.15-3 compares the average monthly water surface elevations for Crystal Springs Reservoir based on the 82-year period of hydrologic record under the baseline condition and with the proposed project. The average monthly water surface elevations with the project would be 4 to 8 feet higher than under the baseline condition. The annual average water surface elevation with the project would be about 281.7 feet—about 6.6 feet higher than under the baseline condition.

With the proposed project, the water surface elevation would reach or closely approach its maximum normal value by March in many years. Under the baseline condition, the water surface elevation rarely reaches the maximum normal value in March, with the average monthly value about 4 feet less than the maximum normal elevation. The normal maximum water surface elevation would be reached more frequently with the proposed project than under the baseline condition, primarily as a result of implementing other WSIP facility improvement projects that would facilitate the conveyance of Tuolumne River water to Crystal Springs Reservoir.

Table 5.15-3 shows the percentage of time each contour around the reservoir perimeter would be inundated under the baseline condition and with the proposed project for the 82-year period of hydrologic record. The percentages are based on monthly data obtained using the HH/LSM and adjusted using scaling factors derived from historical data, but do not take account of daily or weekly water surface elevation fluctuations. The table shows that under the baseline condition, the 281-foot contour would be inundated 13 percent of the time, the 274-foot contour would be inundated about 52 percent of the time, and the 264-foot contour would be inundated about 99 percent of the time. The elevation difference between the contour inundated 10 percent of the time and the contour inundated 90 percent of the time would be about 13.5 feet (approximately between elevations 281.5 and 268 feet).

With the proposed project in place, the zone subject to inundation between 10 and 90 percent of the time would be at a higher elevation compared to baseline conditions. With the project, the 286-foot contour would be inundated about 16 percent of the time, the 281.5-foot contour would be inundated about 50 percent of the time, and the 273-foot contour would be inundated about 99 percent of the time. The elevation difference between the contour inundated 10 percent of the time and the contour inundated 90 percent of the time would be about 12.5 feet (approximately between elevations 286.5 and 274 feet).

The average monthly water surface elevations predicted using the HH/LSM and adjusted using scaling factors derived from historical data, as shown Figure 5.15-3 and Table 5.15-3 (baseline and with-project conditions), may somewhat underestimate the degree to which water surface elevations in Crystal Springs Reservoir fluctuate under both baseline and with-project scenarios, for the reason previously described.



SOURCE: SFPUC, HH/LSM

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.15-3
Crystal Springs Reservoir - Monthly Average Water Surface Elevations

TABLE 5.15-3
CRYSTAL SPRINGS RESERVOIR – PERCENTAGE OF MONTHS THAT A PERIMETER CONTOUR IS INUNDATED

Water Surface Elevation (feet)	Number of Months			Percentage of Months		
	Historical Data (2001–2006)[a]	**Baseline Condition (2005)[b]**	**Proposed Project (2018)[b]**	**Historical Data (2001–2006)[a]**	**Baseline Condition (2005)[b]**	**Proposed Project (2018)[b]**
292.0	0	0	0	0%	0.0%	0.0%
291.5	0	0	0	0%	0.0%	0.0%
291.0	0	0	0	0%	0.0%	0.0%
290.5	0	0	0	0%	0.0%	0.0%
290.0	0	0	0	0%	0.0%	0.0%
289.5	0	0	0	0%	0.0%	0.0%
289.0	0	0	5	0%	0.0%	0.5%
288.5	0	0	8	0%	0.0%	0.8%
288.0	0	0	9	0%	0.0%	0.9%
287.5	0	0	9	0%	0.0%	0.9%
287.0	0	0	15	0%	0.0%	1.5%
286.5	0	0	75	0%	0.0%	7.6%
286.0	0	1	155	0%	0.1%	15.8%
285.5	0	1	258	0%	0.1%	26.2%
285.0	0	7	292	0%	0.7%	29.7%
284.5	0	9	322	0%	0.9%	32.7%
284.0	1	11	367	1.5%	1.1%	37.3%
283.5	2	12	384	3.0%	1.2%	39.0%
283.0	3	13	407	4.5%	1.3%	41.4%
282.5	5	28	417	8.5%	2.8%	42.4%
282.0	7	54	444	11.4%	5.5%	45.1%
281.5	9	100	495	14.2%	10.2%	50.3%
281.0	10	128	554	16.0%	13.0%	56.3%
280.5	11	157	575	17.4%	16.0%	58.4%
280	12	188	591	20.2%	19.1%	60.1%
279	16	198	603	25.8%	20.1%	61.3%
278	21	247	677	33.9%	25.1%	68.8%
277	26	276	778	42.6%	28.0%	79.1%
276	31	370	850	50.8%	37.6%	86.4%
275	35	431	900	56.7%	43.8%	91.5%
274	37	509	902	60.7%	51.7%	91.7%
273	40	578	980	65.0%	58.7%	99.6%
272	42	681	984	70.0%	69.2%	100.0%
271	46	726	984	75.0%	73.8%	100.0%
270	48	780	984	78.7%	79.3%	100.0%
268	52	916	984	85.1%	93.1%	100.0%
266	56	961	984	91.8%	97.7%	100.0%
264	58	981	984	94.7%	99.7	100.0%
262	60	984	984	99.6%	100.0%	100.0%
260	60	984	984	100.0%	100.0%	100.0%

[a] The historical data used were for the 60-month period from July 2001 to July 2006. Inundation frequencies were based on daily data.

[b] The modeled data cover the 984-month period from July 1920 through September 2002. Inundation frequencies were based on monthly time-steps.

Short-Term Water Surface Elevation Excursions above 287.8 feet

Methods. As noted above and in Chapter 3, Project Description, with the improvements in place, there would be times when the SFPUC would allow reservoir water levels to rise above the maximum normal water surface elevation of 287.8 feet. Under almost all conditions, the SFPUC would limit the duration of the exceedences of the maximum normal water surface elevation to no more than 14 days. Under extraordinary conditions, in a 100-year return-period storm or two back-to-back, 50-year return-period storms, an exceedence might last longer than 14 days (Briggs, 2009), but the SFPUC would make efforts to evacuate the additional storage as quickly as possible.

The vegetation on the reservoir perimeter at elevation 287.8 feet and above is currently adapted to upland conditions because the water surface elevation in the reservoir has not reached this level since 1983, but did so occasionally before 1983 (see Figure 5.15-2). In the future, the upland vegetation between elevation 287.8 and 291.8 feet would be subject to occasional inundation when runoff from sudden large storms entered the reservoir. Depending on the timing and duration of inundation, some upland plants could be harmed, as described in 5.13, Biological Resources.

Because the HH/LSM is a monthly time-step model that simulates storage in the SFPUC's reservoirs at the end of each month, it cannot simulate short-term changes in storage that result from sudden storms that may only last for a few days or a week or two. In the case of Crystal Springs Reservoir, the model cannot simulate the daily or weekly changes in storage that might result from storm runoff into the reservoir or operational adjustments to the rate at which water enters the reservoir from the Tuolumne River and Pilarcitos and Alameda Creeks watersheds, or leaves the reservoir en route to San Andreas Reservoir and the Harry Tracy Water Treatment Plant. Consequently, the HH/LSM cannot be used to estimate the duration of inundation of lands above elevation 287.8 feet because, as noted above, exceedences of the maximum normal water surface elevation would typically last 14 days or less.

In light of the limitations of the HH/LSM, a spreadsheet model was developed to analyze the effect of sudden storms on storage in Crystal Springs Reservoir (see Appendix M). Published rainfall intensity maps were used to estimate runoff into Crystal Springs Reservoir in 2-, 5-, 10- 25-, 50-, and 100-year return-frequency storms. The runoff estimates were used to calculate the increases in storage and water surface elevation that would occur for different sizes and frequencies of storms. The duration of inundation of perimeter contours between elevation 287.8 and 291.8 feet for different sizes of storms and under different reservoir management scenarios was then estimated.

Results. As described in Chapter 3, Project Description, with the proposed project in place the SFPUC would occasionally permit the water level in Crystal Springs Reservoir to exceed the maximum normal water surface elevation of 287.8 feet. The excursions above 287.8 feet could occur up to three times in a year and could persist for up to 14 days. It is expected that excursions would occur in about one year in three (Briggs, 2009).

Excursions or exceedances above 287.8 feet would be most likely to occur in the late winter and early spring (Briggs, 2009). With the proposed project in place, the SFPUC would reduce storage in Crystal Springs Reservoir in November by up to 2 billion gallons, as it does under the existing condition. The reduced storage provides capacity in the reservoir so that the SFPUC can capture and use the runoff produced by storms passing over the reservoir watershed. With the 2-billion-gallon flood storage reservation in place, only very large storms (50-year return period or greater) would cause the water surface elevation in the reservoir to rise above 287.8 feet.

In early March, the SFPUC would begin eliminating the flood storage reservation and would bring the reservoir back up to its normal maximum water surface elevation. If a storm occurred over the watershed during or after the flood reservation was eliminated, the SFPUC would allow the water level to rise above the maximum normal water surface elevation (i.e., an exceedance) to capture and use runoff from the storm. Most storms occurring in March or April when the flood reservation has been eliminated would raise the water surface elevation by 1 or 2 feet. Large and infrequent storms (25-year return-period storms and greater) occurring in March or April could raise the water surface elevation by about 4 feet, to the spillway elevation and slightly above. Based on rainfall records and estimated runoff from various size storms, it was conservatively estimated that the water surface water elevation could rise to an elevation of 290 feet and persist at that level for 2 to 3 days in March or April about once every 35 years (see Appendix M).

Impact HY-5: Long-term effects on flow along lower San Mateo Creek.

Lower Crystal Springs Dam Vicinity

The proposed future operations of Crystal Springs Reservoir and LCSD could affect dry-season flow in lower San Mateo Creek. As described above (see Impact HY-1), pipe leakage and seepage around the dam are affected by hydrostatic pressure, stemming from the weight of water behind the dam. Because the project would result in an increase in average annual water surface elevation of about 6.6 feet, it would increase hydrostatic pressure, which could increase the rate of leakage and seepage by a small amount, probably in the range of 0 to 10 percent. The increase in leakage and seepage would cause a corresponding increase of no more than 10 percent in dry-season flow along lower San Mateo Creek.

The existing dry-season flow in lower San Mateo Creek immediately below the LCSD is estimated to be 0.7 cfs. Leakage from the 60-inch pipe would be diverted during construction but restored to its existing location following completion of construction in order to maintain existing flow conditions in San Mateo Creek. Flow increases in a downstream direction as a result of infiltration of groundwater and small dry-season flows from tributaries and urban storm drains. Operation of the proposed project could slightly add to dry-season creek flow as a result of increased leakage and seepage at the dam, but would otherwise have no effect on the dry-season flow regime.

During wet weather, flow increases in the creek immediately below the LCSD as a result of stormwater discharges from I-280 into the stilling basin through a drainage pipe on the south abutment of the dam, and stormwater from the Skyline Boulevard Bridge that flows over the eastern edge of the bridge, onto the downward face of the dam, and then into the stilling basin and San Mateo Creek. With the proposed project in place, stormwater from I-280 and the Skyline Boulevard Bridge would continue to be discharged into San Mateo Creek and the rate of stormwater discharge would be the same as it is under the existing condition. Flow further increases in a downstream direction as tributaries and urban storm drains add flow to the creek. Any increase in the rate of leakage and seepage at the dam would be inconsequential in relation to wet-weather flow in lower San Mateo Creek. Operation of the project would have no effect on the wet-weather flow regime of the creek.

Flow in lower San Mateo Creek with the proposed project in place would be affected by occasional controlled releases and very rare uncontrolled spills from Lower Crystal Springs, as it is under the existing condition. Under current conditions, the SFPUC can make controlled releases of up to about 600 cfs from Crystal Springs Reservoir to San Mateo Creek through pipes and valves at the dam. The proposed project would not increase the maximum possible controlled release, and there would be no change in uncontrolled releases over the dam spillway. As noted above, one of the SFPUC's current operating goals is to avoid releases or spills from Crystal Springs Reservoir; avoiding releases or spills would remain an important operating goal with the project in place. The frequency and volume of future with-project releases and spills would be the same or similar to the frequency and volume of existing spills and releases.

Operation of the proposed project would not substantially change the flow regime along lower San Mateo Creek. Therefore, project operation would have a *less-than-significant* impact on flow in lower San Mateo Creek. No mitigation is necessary.

Sampling Station #5 Vicinity

The raising of Sampling Station #5 is an ancillary project component needed to accommodate the proposed changes in reservoir operations once the dam improvements are completed. The improvements to Sampling Station #5 themselves would not affect future reservoir levels which in turn, could affect flow in lower San Mateo Creek. Thus, long-term impacts to flow along lower San Mateo Creek are *not applicable* to this site.

Impact HY-6: Increased flood hazards along lower San Mateo Creek during project operations.

Lower Crystal Springs Dam Vicinity

As described above in Section 5.15.1, Setting, although flood control is not a purpose of Crystal Springs Reservoir, the effect of the reservoir, and the SFPUC's current operating protocol for the reservoir, has been to greatly reduce the risk of flooding along lower San Mateo Creek as a result of ordinary storms over the upper watershed. Flood hazards with the proposed project in place would be similar to the existing condition. With the reservoir's storage capacity restored and an operating protocol in place that would provide a wintertime flood reservation and restrict the normal maximum water surface to a level 4 feet below the spillway, flood risk during ordinary storms would be comparable to current flood risk.

Flood hazards would be reduced during extraordinary storms that could generate flow up to the PMF. Because the LCSD with the proposed improvements would pass the PMF without damage, flood hazards in the areas along lower San Mateo Creek downstream of the dam would be decreased. This would be a *beneficial* effect of the project.

Sampling Station #5 Vicinity

The Sampling Station #5 vicinity drains to Upper Crystal Springs Reservoir, not San Mateo Creek. The proposed improvements to Sampling Station #5 would not affect future reservoir levels which in turn, could affect flooding in lower San Mateo Creek. Thus, impacts related to flooding hazards along lower San Mateo Creek due to future project operations are *not applicable* to this site.

Impact HY-7: Long-term effects on groundwater levels and quality in the vicinity of Crystal Springs Reservoir and the LCSD.

Lower Crystal Springs Dam Vicinity

Operation of the proposed project could affect groundwater levels in the vicinity of Crystal Springs Reservoir and the LCSD.

As noted above, the average water surface elevation in Crystal Springs Reservoir with the proposed project in place would be several feet higher than it would be under the existing condition. As a consequence, the groundwater table in the water-bearing strata in the lands surrounding the reservoir would be a few feet higher than it would be in the existing condition. The effects of the raised water surface elevation on groundwater levels would extend for a few feet to several hundred feet from the reservoir perimeter, depending on the surrounding topography. Hydrostatic pressure in fissures in the rock strata that form the abutments of the LCSD would increase, which could result in a slight increase in groundwater seepage under and around the dam.

Operation of the proposed project would not substantially deplete groundwater supplies or affect the productivity of any wells. There are no wells around the perimeter of Crystal Springs Reservoir. Therefore, project operation would have a *less-than-significant* impact on groundwater levels in the vicinity of Crystal Springs Reservoir and the LCSD. No mitigation is necessary.

Sampling Station #5 Vicinity

The raising of Sampling Station #5 is an ancillary project component needed to accommodate the proposed changes in reservoir operations once the dam improvements are completed. The improvements to Sampling Station #5 themselves would not affect future reservoir levels which in turn, could affect groundwater levels and quality. Thus, long-term impacts to groundwater are *not applicable* to this site.

Impact HY-8: Long-term impacts on water quality in San Mateo, San Andreas, and Laguna Creeks, and Crystal Springs Reservoir.

Operation of the proposed project could affect water quality in Crystal Springs Reservoir and in lower San Mateo Creek, downstream of the LCSD.

Lower Crystal Springs Dam Vicinity

San Andreas, Laguna, and Upper San Mateo Creeks. As noted above, the average water surface elevation in Crystal Springs Reservoir with the proposed project in place would be several feet higher than it would be under the existing condition. As a consequence, several hundred feet of the creek channels of upper San Mateo and Laguna Creeks that would otherwise be free-flowing would be inundated much of the time. The channel of San Andreas Creek would not be affected by the higher reservoir water level because its lower reaches drain to Tracy Lake, a small seasonal water body at the extreme northern end of Crystal Springs Reservoir. Tracy Lake is connected to Lower Crystal Springs Reservoir by a culvert equipped with a gate that is normally closed.

Water quality in the reaches of the creeks that would be frequently submerged would be the same as water quality in Crystal Springs Reservoir, which is probably somewhat better than water quality in the creeks above their confluence with the reservoir. The change in water quality would have no effect on the ability of the creeks to support their existing designated beneficial uses (freshwater replenishment, fish spawning, and rare and endangered species) or their potential beneficial uses (water-contact recreation, non-water-contact recreation, and cold freshwater fish habitat) (see Section 5.13, Biological Resources, for information on impacts related to fish spawning and rare and endangered species). Thus, proposed future operations would have a *less-than-significant* effect on water quality in San Andreas, Laguna, and upper San Mateo Creeks. No mitigation is necessary.

Crystal Springs Reservoir. As noted above, the average water surface elevation in Crystal Springs Reservoir with the proposed project in place would be several feet higher than it would be under the existing condition. Because local runoff from the reservoir watershed is typically completely captured under existing conditions and would also be completely captured with the project in place, the additional water that would be stored in the reservoir under the future with-project condition would be from the Tuolumne River or the Alameda Creek watershed. Thus, in the future, the proportion of imported water supplies from the Tuolumne River and the Alameda Creek watershed stored in Crystal Springs Reservoir would be somewhat greater than it has been since the DSOD restriction was put in place. As described earlier, water from these sources has been subject to chloramination and dechloramination and adds small amounts of nitrogen to the reservoir. The increase in nitrogen in the reservoir could result in an increase in algal growth, although this would only occur if nitrogen is the nutrient that is limiting algal growth. If algal growth is phosphorus-limited, then the increase in nitrogen would have no effect on algal growth. It is not expected that the proposed project would result in a substantial change in water quality or algal growth rates. Overall, the increase in the proportion of high-quality Tuolumne River water in Crystal Springs Reservoir would be beneficial to the water quality. The change in water quality would have no effect on the ability of the reservoir to support its existing designated beneficial uses (municipal and domestic water supply, non-water-contact recreation, cold freshwater habitat, warm freshwater habitat, fish spawning, wildlife habitat, and rare and endangered species). Thus, proposed future operations would have a *less-than-significant* effect on water quality in Crystal Springs Reservoir. No mitigation is necessary.

Lower San Mateo Creek. Operation of the proposed project could affect water quality along lower San Mateo Creek if project-induced changes in streamflow were to alter certain water quality characteristics, such as turbidity, water temperature, and dissolved oxygen content.

The project includes restoring, reseeding, and replanting all areas disturbed during construction activities. Discharges of eroded soil from the restored construction site to lower San Mateo Creek could increase slightly above current levels in the first few rainy seasons following construction, but the quality of runoff and drainage at the construction site would be expected to return to preconstruction levels within two or three years as the new vegetation becomes established.

As noted above, the proposed project would have no effect on wet-weather flow along lower San Mateo Creek and only a minimal effect on dry-weather flow. Increased seepage under and around the dam could slightly increase dry-weather flow in the creek. Increased dry-weather flow could reduce water temperatures in the stream and increase dissolved oxygen content in the reach of the creek immediately below the dam, but the change in water quality characteristics would not likely be measurable. The slight increase in dry-weather flow could theoretically increase erosion and water turbidity, but this phenomenon is unlikely because readily erodible material in the creek channel is regularly removed by the annual large wet-weather flows originating from the I-280 drainage system.

Operation of the proposed project would not be expected to substantially impair water quality along San Mateo Creek or affect the ability of lower San Mateo Creek to support its existing designated beneficial uses (freshwater replenishment, fish spawning, and rare and endangered species) or its potential beneficial uses (water-contact recreation, non-water-contact recreation, and cold freshwater fish habitat) (see Section 5.13, Biological Resources, for information on impacts related to fish spawning and rare and endangered species).

Lower San Mateo Creek is listed as out-of-compliance with ambient water quality standards for diazinon, a commonly used pesticide. Operation of the proposed project would have no effect on diazinon concentrations in the creek. Thus, project operation would have a *less-than-significant* effect on water quality in lower San Mateo Creek. No mitigation is necessary.

Future maintenance of the completed improvements to the LCSD calls for painting and repairing structures as needed, and cleaning the stilling basin twice a year (see Chapter 3, Project Description). This maintenance would involve pumping standing water from the stilling basin to a storage tank located away from the creek channel to allow the water to settle before it is released back to San Mateo Creek. All discharges would conform to applicable water quality standards. Sediment and any other debris in the dry basin would be removed and hauled to an approved disposal site.

The purpose of maintenance would be to remove accumulated sediment and minor vegetation and to inspect the portions of the basin that are usually underwater. Currently, water and sediment discharged from the 30-inch stormwater drainage pipe from I-280 accumulates in a portion of the stilling basin upstream of a concrete sill that crosses the basin. The area in which water and sediment accumulates is about 87 feet wide, 15 feet long and 3 feet deep (maximum volume is 145 cubic yards or 30,000 gallons). Every three to five years the SFPUC pumps the water out of the stilling basin into San Mateo Creek. A diffuser is used to minimize turbidity, erosion of creek bed and banks, and sediment is cleared out mostly by machine.

In the future following completion of improvements, water and sediment discharged from the 30-inch stormwater drainage pipe from I-280 would accumulate in a portion of the stilling basin upstream of the series of sill blocks that would cross the new basin. The area in which water and sediment would accumulate would be about 138 feet wide, 92 feet long and 2 foot 9 inches deep (maximum volume would be 1,293 cubic yards or 260,000 gallons). Twice a year, the SFPUC would pump the water out of the stilling basin to a storage tank located away from the creek channel to allow the water to settle before it is released back into San Mateo Creek. All discharges would conform to applicable water quality standards. Sediment and any other debris in the dry basin would be removed and hauled to an approved disposal site (SFPUC, 2009c).

It is expected that the amount of sediment that discharges to the stilling basin would be the same in the future as it is under the current condition. However, the volume of water accumulated in the stilling basin would be up to 9 times greater, but it could be less if the new stilling basin floor is at a higher elevation relative to any changes in the elevation of the groundwater table and also depending on the extent of evaporation. Since the SFPUC would schedule this maintenance work outside the rainy season, some standing water in the stilling basin would be lost to evaporation, so the actual amounts of water pumped out could be much less than the maximum possible. If cleaning of the stilling basin occurs at the end of the summer, most of the water in the basin would have evaporated. Therefore, the volume of water discharged to lower San Mateo Creek due to proposed maintenance activities would likely be similar to the existing conditions. Because the proposed maintenance would pump water from the stilling basin to a storage tank located away from the creek channel to allow the water to settle before discharging it to the creek and because discharges to San Mateo Creek would be in conformance with applicable water quality standards, proposed maintenance activities would have a *less-than-significant* effect on water quality in lower San Mateo Creek. No mitigation is necessary.

Sampling Station #5 Vicinity

The raising of Sampling Station #5 is an ancillary project component needed to accommodate the proposed changes in reservoir operations once the dam improvements are completed. The improvements to Sampling Station #5 themselves would not affect future reservoir levels such that water quality would be affected. Thus, long-term impacts on water quality as a result of future operations are *not applicable* to this site.

Impact HY-9: Operational effects on the geomorphology along San Mateo, San Andreas, and Laguna Creeks.

Lower Crystal Springs Dam Vicinity

Operation of the proposed project could affect geomorphology along upper and lower San Mateo Creek and San Andreas and Laguna Creeks.

San Andreas, Laguna, and Upper San Mateo Creeks. As noted above, the average water surface elevation in Crystal Springs Reservoir with the proposed project in place would be several feet higher than it would be under the existing condition. As a consequence, several hundred feet of the creek channels of Laguna and upper San Mateo Creeks that are currently free-flowing would be inundated some of the time. The creek channel of San Andreas Creek would not be affected by the higher reservoir levels because its lower reaches drain to Tracy Lake, a small seasonal water body at the extreme northern end of Lower Crystal Springs Reservoir. Tracy Lake is connected to Lower Crystal Springs Reservoir by a culvert equipped with a gate that is normally closed.

Laguna and upper San Mateo Creeks drain relatively steep terrain. Water descending the creeks carries sediment that drops out when flowing water slows and enters Crystal Springs Reservoir. Deltas have formed at the mouths of the creeks where sediment has accumulated over the 120 years since the reservoir was built. The project-induced rise in the average water surface elevation would result in sediment accumulation several hundred feet upstream of the existing deltas and a consequent gradual reshaping of several hundred feet of the two creek channels. Operation of the proposed project would not substantially affect drainage patterns upstream of the reservoir or channel form along all but several hundred feet of upper San Mateo and Laguna Creeks. It would have no affect on drainage patterns or channel form in San Andreas Creek. Thus, project operation would have a *less-than-significant* effect on the geomorphology of upper San Mateo, San Andreas, and Laguna Creeks.

Lower San Mateo Creek. As noted above, the proposed project would have no effect on wet-weather flow along lower San Mateo Creek and only a minimal effect on dry-weather flow. Increased seepage under and around the dam could slightly increase dry-weather flow in the creek. The increase in flow could cause some alteration of channel characteristics, but the effects would be minor when compared to discharges from the I-280 drainage system. Furthermore, the creek channel downstream of the LCSD is resistant to erosion during low flows because much of the fine material in the channel is washed out by the annual large flows from the I-280 storm drain. Operation of the proposed project would not substantially affect drainage patterns or channel form along lower San Mateo Creek. Thus, project operation would have a *less-than-significant* effect on geomorphology along lower San Mateo Creek. No mitigation is necessary.

Sampling Station #5 Vicinity

Future operations at Sampling Station #5 would have no effect on discharges to San Mateo, Laguna, and San Andreas Creeks, nor Crystal Springs Reservoir. Impacts related to long-term changes in geomorphology are *not applicable* to this site.

5.15.3.6 Mitigation Measures

Mitigation Measure M-HY-3: Preparation and Implementation of a SWPPP.

Construction projects involving one or more acres of land disturbance would be required to obtain coverage under the NPDES General Permit for Stormwater Discharges Associated with Construction Activity. In accordance with these requirements, the SFPUC or its contractor(s) would be required to submit a Notice of Intent to the SWRCB's Division of Water Quality, develop a SWPPP, and implement site-specific BMPs to prevent discharges of non-point source pollutants in construction-related stormwater runoff into downstream storm drains and water bodies, including San Mateo Creek. The San Francisco Bay RWQCB, the primary agency responsible for protecting water quality within the project area, is responsible for reviewing and ensuring compliance with the SWPPP. This review is based on the general permit issued by the SWRCB.

The recommended BMPs, subject to the review and approval of the RWQCB, include the following measures. However, the measures themselves may be altered, supplemented, or deleted during the RWQCB's review process, since the RWQCB has final authority over the terms of the SWPPP.

a. *Scheduling*

- Schedule construction to minimize ground disturbance during the rainy season
- Sequence construction activities to minimize the amount of time that soils remain disturbed
- Stabilize all disturbed soils as soon as possible following the completion of ground-disturbing work in any area of the project site
- Provide plans to stabilize soil with vegetation or physical means in the event rainfall is expected
- Install erosion and sediment control BMPs prior to the start of any ground-disturbing activities

b. *Erosion and Sedimentation*

- Preserve existing vegetation in areas where no construction activity is planned or where construction activity will occur at a later date

- Stabilize and revegetate disturbed areas as soon as possible after construction with planting, seeding, and/or mulch (e.g., straw or hay, erosion control blankets, hydromulch, or other similar material), except in actively cultivated areas
- Install silt fences, coir rolls, and other suitable measures around the perimeter of the construction zone, staging areas, storm drains, temporary stockpiles, spoil areas, stream channels, swales, down-slope of all exposed soil areas, and other locations determined necessary to prevent offsite sedimentation
- Install temporary slope breakers during the rainy season on slopes greater than 5 percent where the base of the slope is less than 50 feet from a water body, wetland, or road crossing at spacing intervals required by the RWQCB
- Use filter fabric or other appropriate measures to prevent sediment from entering storm drain inlets
- Detain and treat stormwater and water produced by construction site dewatering using sedimentation basins, sediment traps (when water is flowing and there is sediment), baker tanks, or other measures to ensure that discharges to receiving waters meet applicable water quality objectives

c. *Reservoir Protection*

- Install fine mesh netting below the top of the dam to prevent construction materials from falling into the reservoir

d. *Groundwater/Dewatering*

- Prepare a dewatering plan prior to excavation specifying methods of collection, transport, treatment, and discharge of all water produced by construction site dewatering in compliance with the local standards and discharge permit requirements
- Impound water produced by dewatering in sediment retention basins or other holding facilities to settle the solids and provide treatment as necessary prior to discharge to receiving waters to meet San Francisco Bay Basin Plan water quality objectives
- Control discharges of water produced by dewatering to prevent erosion
- Locate sedimentation basins and other retention and treatment facilities away from waterways to prevent silt-bearing water from reaching streams

e. *Tracking Controls*

- Grade and stabilize construction site entrances and exits to prevent runoff from the site and to prevent erosion
- Take measures to prevent the loss of materials into San Mateo Creek when construction vehicles cross the site access bridge
- Install a facility at the site access to allow for tire washing when vehicles exit the site
- Remove any soil or sediment tracked off paved roads during construction by employing street sweeping

f. *In-Stream – Construction BMPs*

- Minimize disturbance of the ground surface and substrate within the ordinary high water mark of lower San Mateo Creek

- Monitor in-stream construction activity and coordinate with the contractor to identify periods when localized increases in turbidity may occur
- Prevent raw cement, concrete or concrete washings, asphalt, paint or other coatings, oil or other petroleum products, or any other substances that could be hazardous to aquatic life from contaminating the soil or entering watercourses
- Place by hand any physical barriers within lower San Mateo Creek to isolate the construction area for dewatering purposes or control of construction-related stormwater discharges (erosion and sediment control), avoiding the use of vehicles in the creek channel, and carry out the barriers under guidance of a qualified fish biologist to ensure avoidance and minimization of stress, injury, or mortality to aquatic wildlife
- Install a silt curtain or other sedimentation control measures to trap sediment and prevent sediment and silt load increases to waterways during in-stream project construction
- Keep visible oil, grease, or foam from forming on soil or water surfaces
- In the event that construction activities create a visible plume in surface waters, initiate monitoring of turbidity concentrations at the discharge site and 300 feet downstream while the visible plume persists and initiate corrective action to reduce construction-related turbidity to be in accordance with turbidity criteria specified in the Basin Plan for coldwater fish habitat beneficial use, as measured in surface waters 300 feet downstream of the working area
- Avoid operation of construction vehicles and equipment in flowing water

g. *Non-stormwater Control*

- Store all equipment, materials fuels, lubricants, solvents, and other possible contaminants outside lower San Mateo Creek's ordinary high water mark
- Place drip pans under construction vehicles and all parked equipment
- Check construction equipment for leaks regularly
- Wash construction equipment in a designated enclosed area regularly
- Contain vehicle and equipment wash water for percolation or evaporative drying away from storm drain inlets and to prevent runoff into San Mateo Creek, Crystal Springs Reservoir, and the Pulgas Discharge Channel.
- With the exception of vehicles and equipment on barges in Crystal Springs Reservoir, refuel all other vehicles and equipment at least 50 feet away from San Mateo Creek, Crystal Springs Reservoir, the Pulgas Discharge Channel, and other water bodies to minimize the risk of run-on, runoff, and spills that could affect waterbodies
- Conduct refueling in paved and curbed areas to contain any spills if this is possible; if not, refuel over drip pans or adsorptive mats
- Cover all storm drain inlets when paving or applying seals or similar materials to prevent the offsite discharge of these materials

h. *Waste Management and Hazardous Materials Pollution Control*

- Remove trash and construction debris from the project area daily
- Locate sanitary facilities a minimum of 300 feet from San Mateo Creek

- Maintain sanitary facilities regularly
- Store all hazardous materials in an area protected from rainfall and stormwater run-on and prevent the offsite discharge of leaks or spills
- Minimize the potential for contamination of Crystal Springs Reservoir, San Mateo Creek, the Pulgas Discharge Channel, and other waters by maintaining spill containment and cleanup equipment onsite, and by properly labeling and disposing of hazardous wastes
- Locate waste collection areas close to construction entrances and away from roadways, storm drains, San Mateo Creek, Crystal Springs Reservoir, and the Pulgas Discharge Channel
- Inspect dumpsters and other waste and debris containers regularly for leaks and remove and properly dispose of any hazardous materials and liquid wastes placed in these containers
- Train construction personnel in proper material delivery, handling, storage, cleanup, and disposal procedures

i. *BMP Inspection, Maintenance, and Repair*

- Inspect all BMPs regularly to confirm proper installation and function
- Inspect all stormwater BMPs daily during storms
- Inspect sediment basins, sediment traps, and other detention and treatment facilities regularly throughout the construction period
- Provide sufficient devices and materials (e.g., silt fence, coir rolls, erosion blankets, etc.) throughout project construction to enable immediate repair or replacement of failed BMPs
- Inspect all seeded areas regularly for failures, and remediate or repair immediately

j. *Permitting Monitoring and Reporting*

- Obtain and comply with RWQCB Section 401 Water Quality Certification and CDFG Streambed Alteration Agreement
- Provide the required documentation for SWPPP inspections, maintenance, and repair requirements
- Maintain written records of inspections, spills, BMP-related maintenance activities, corrective actions, and visual observations of offsite discharges of sediment or other pollutants, as required by the RWQCB
- Monitor water quality to assess the effectiveness of control measures
- Notify the RWQCB, CDFG, U.S. Fish and Wildlife Service, and National Marine Fisheries Service if the criteria for turbidity, oil/grease, or foam are exceeded and undertake corrective actions
- Notify the RWQCB, CDFG, U.S. Fish and Wildlife Service, and National Marine Fisheries Service immediately of any spill of petroleum products or other organic or earthen materials and undertake corrective action

k. *Post-construction BMPs*

- Revegetate all temporarily disturbed areas as required after construction activities are completed
- Remove any remaining construction debris and trash from the project site and area upon project completion
- Phase the removal of temporary BMPs as necessary to ensure stabilization of the site
- Maintain post-construction site conditions to avoid any unintended drainage channels, erosion, or areas of sedimentation
- Correct post-construction site conditions as necessary to comply with the SWPPP and any other pertinent RWQCB requirements

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5.15.3.7 Cumulative Impacts

Impact C-HY: Cumulative impacts on water quality and hydrology.

The geographic scope of potential water quality and hydrology cumulative impacts is the same as that for direct project impacts, namely the watershed draining to Crystal Springs Reservoir, Crystal Springs Reservoir, and lower San Mateo Creek. Projects that could cause cumulative environmental impacts, when considered together with the proposed project, are described in Section 5.1.4, Projects Considered in the Cumulative Analysis, and listed in Table 5.1-1.

Two SFPUC projects and a County of San Mateo project could have cumulative construction impacts on hydrology and water quality when considered together with the proposed project—the Crystal Springs/San Andreas (CSSA) Transmission Upgrade project, the Crystal Springs Pipeline No. 2 (CSPL2) Replacement project and San Mateo County's Crystal Springs Dam Bridge Replacement project. Cumulative construction impacts would only occur if the four projects have concurrent or overlapping construction schedules. If this were the case, then the discharge of eroded soil and other materials to lower San Mateo Creek during simultaneous construction of the three projects in the same vicinity would be potentially greater than for the proposed project alone. This is a potentially significant cumulative impact. However, as described in Mitigation Measure M-HY-3 (Preparation and Implementation of a SWPPP), the proposed project would be required to implement best management practices and other site-specific requirements of its SWPPP for protection of water quality in San Mateo Creek, in compliance with the NPDES General Permit for Stormwater Discharges Associated with Construction Activity requirements. And, the other three projects would also be required to implement a SWPPP. Assuming implementation of these control measures, the proposed project's contribution would not be cumulatively considerable, and cumulative impacts on hydrology and water quality during construction would be *less than significant*.

Currently, dry-weather flow in lower San Mateo Creek is estimated at 0.7 cfs, with 0.6 cfs estimated to be leakage from pipes and the remainder to be seepage through and around the LCSD. As described in Impact HY-5, the proposed project could result in an increase in seepage of up to about 10 percent, which would produce a very slight increase in dry-weather flow. As part of the CSSA Transmission Upgrade project, the SFPUC would replace the leaky pipes that provide dry-weather flow to lower San Mateo Creek. However, the CSSA Transmission Upgrade project includes installation a new low-flow valve to maintain baseline stream flow conditions in lower San Mateo Creek and prevent impacts to dry-weather flow levels. Thus, there would be no cumulative effect on hydrology in lower San Mateo Creek associated with implementation of the proposed project in combination with the CSSA Transmission Upgrade project.

At Sampling Station #5, there would be the potential for cumulative construction impacts associated with overlapping construction activities from the Pulgas Discharge Channel Modifications project together with the proposed project. However, both projects would be required to implement best management practices and other site-specific requirements of their SWPPP for protection of water quality such that cumulative impacts would be *less than significant* and the proposed project's contribution would not be cumulatively considerable.

None of the projects listed in Table 5.1-1 would contribute to long-term water quality impacts, and some would result in beneficial impacts to water quality (e.g., Pulgas Modification of Existing Dechloramination Facility), so there would be no long-term, cumulative water quality impacts.

5.15.4 References

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5.16 Hazards and Hazardous Materials

This section provides an assessment of potential impacts related to hazards and hazardous materials that might be present in the vicinity of the Lower Crystal Springs Dam Improvements (LCSDI) project. Potential hazards addressed in this section include public exposure to naturally occurring asbestos and hazardous building materials, releases of hazardous materials during construction, and fires.

5.16.1 Setting

5.16.1.1 Potential Presence of Hazardous Materials in Soil and Groundwater

Historical Land Uses

As described in Section 5.5, Cultural and Paleontological Resources, development of SFPUC water supply facilities in the Peninsula watershed began during the 19th century, with Lower Crystal Springs Dam (LCSD) built in 1890. With the exception of SFPUC facilities in the immediate vicinity of the LCSD and the construction of Interstate 280 (I-280), the Peninsula watershed has been largely untouched by urban development. Therefore, the potential for hazardous materials to be present in subsurface materials in the project area is considered low.

Environmental Database Review

Lower Crystal Springs Dam Vicinity

An environmental database review (EDR, 2007a) was conducted for the LCSD vicinity to identify permitted hazardous materials uses,[1] environmental cases,[2] and spill sites[3] within ASTM International (ASTM)–specified search distances of the project area. The database search identified the following two sites:

- **Interstate 280 at San Mateo Creek.** There was a release of small quantities of lead into area soils during a seismic retrofit of the I-280 bridge above the project site prior to 1998 by the California Department of Transportation (Caltrans) (Smith, 2008). This site is classified as a Resource Conservation and Recovery Act Small Quantity Generator,[4] and more than 48 tons of hazardous waste consisting of inorganic solids was transported off-site for disposal.

- **Caltrans Pump Station.** This site is located at the I-280 and Highway 92 interchange in the city of San Mateo. It is identified in the Leaking Underground Storage Tank Incident Reports (LUST) database, which inventories reported leaking underground storage tank incidents. Although soil or groundwater quality may have been affected by a leaking underground tank, this site is located more than 0.5 mile east of Crystal Springs Reservoir and more than 1.5 miles south of the LCSD; therefore, the site has a low potential to affect soil or groundwater quality in the areas where construction would occur or the areas that would be inundated when the reservoir capacity is restored.

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[1] Permitted hazardous materials uses are facilities that use hazardous materials or handle hazardous wastes but comply with current hazardous materials and hazardous waste regulations.

[2] Environmental cases are sites where soil and/or groundwater contamination is known or suspected to have occurred, and that are identified on regulatory agency lists.

[3] Spill sites are locations of spills reported to state or federal regulatory agencies; such releases may or may not have involved hazardous materials.

[4] Small Quantity Generators generate between 100 and 1,000 kilograms of hazardous waste per month.

Sampling Station #5 Vicinity

An environmental database review conducted for the vicinity of Sampling Station #5 (EDR, 2007b) indicated that the SFPUC has filed a hazardous materials business plan with the San Mateo County Environmental Health Services Division for the Pulgas Pump Station because it stores motor vehicle fuels or generates hazardous waste. The SFPUC also uses sodium hypochlorite, sodium bisulfite, and carbon dioxide to dechloraminate water from the Pulgas Balancing Reservoir prior to discharging it to Upper Crystal Springs Reservoir. These chemicals are stored at the Pulgas Dechloramination Facility, which was constructed to the southeast of the channel in 2001; however, this facility was not identified during the environmental database review. There are no records of spills or releases at these sites, and neither facility is identified as an environmental case; therefore, soil or groundwater contamination is unlikely in the vicinity of Sampling Station #5. There are no other permitted hazardous materials uses, environmental cases, or spill sites within ASTM-specified search distances from Sampling Station #5.

5.16.1.2 Existing Hazardous Building Materials

The SFPUC would demolish the LCSD's stilling basin as part of the proposed project, and portions of the parapet wall and spillway would also be demolished or modified. These structures were constructed in the late 1800s and early 1900s when hazardous building materials, such as asbestos, polychlorinated biphenyls (PCBs), and lead-based paint,[5] were in use. However, none of the structures to be demolished are painted, and therefore no lead-based paint would be encountered during demolition or modification of the structures. Further, because these structures were constructed primarily of wood and concrete and do not include any electrical components, it is not likely that they contain asbestos or PCBs. The SFPUC would also raise the existing Sampling Station #5, which could include lead-based paint, but does not likely contain other hazardous building materials such as asbestos or PCBs because the sampling station was constructed in the last three years.

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[5] Lead-based paint is paint that contains lead, a heavy metal that was historically added to paint as pigment and to speed drying, increase durability, retain a fresh appearance, and resist moisture (which causes corrosion). In 1978, the U.S. Consumer Product Safety Commission banned paint containing more than 0.6 percent lead for residential use, but such paint continues to be used in some industrial applications. Lead is toxic to humans, particularly young children, and can cause a range of human health effects depending on the level of exposure. When adhered to the surface of a material, lead-based paint poses little health risk. Where the paint is delaminated or chipping, it can cause a potential threat to the health of young children or other building occupants who may ingest the paint. Lead dust also presents public health risks during the demolition of structures that contain lead-based paint, particularly when metal coated with paint containing lead is torch cut. Similarly, the lead concentrations of coatings applied as glaze to many types of ceramic tiles may result in exposure to workers when broken tiles generate dust. Lead-based paint that has separated from a structure and dust generated from breaking ceramic tiles may also contaminate nearby soil.

There are approximately 125 stoplogs that are currently used to raise the crest of the spillway that would be removed during construction of improvements to the dam, and 35 of these stoplogs appear to be pressure treated[6] lumber. Because treated wood contains hazardous chemicals at elevated levels, it can be characterized as a hazardous waste under California regulations (DTSC, 2008b). The Department of Toxic Substances Control (DTSC) has developed alternative management standards that allow for disposal of treated wood as a non-hazardous waste (see Section 5.16.2, Regulatory Framework, below).

5.16.1.3 Naturally Occurring Asbestos

In 1986, by California Air Resources Board (CARB) identified naturally occurring asbestos, which is present in many parts of California, as a toxic air contaminant (TAC). Naturally occurring asbestos is commonly associated with serpentine[7] and ultramafic[8] rock types such as Franciscan Complex mélange. Chrysotile (a form of asbestos from the serpentine mineral group) and amphibole asbestos (including crocidolite) are naturally occurring asbestos minerals that may present a human health hazard if they become airborne.

As discussed in Chapter 3, Project Description, and Section 5.14, Geology and Soils, the proposed project would involve excavation (and possibly blasting) for construction of the new stilling basin, which is underlain by alluvial materials and mélange of Franciscan Complex bedrock. Grading for construction of the temporary access road adjacent to the stilling basin would also take place in alluvial materials derived from Franciscan Complex bedrock. Staging Area 9 at the Lower Crystal Springs Reservoir boat ramp and the existing access road to the boat ramp are underlain by serpentinite of the Franciscan Complex. Additionally, Staging Area 7 is located on artificial fill that could have been derived from Franciscan Complex bedrock. Thus, excavation and grading at the stilling basin and adjacent temporary access road, and grading at Staging Areas 7 and 9 would occur in materials that could potentially contain naturally occurring asbestos.

5.16.1.4 Wildfire Hazards

The project area's Mediterranean climate is characterized by long, dry, hot summers and cool, rainy winters. Most measurable rainfall occurs from mid-October to mid-April and in most years results in abundant grass growth. May to October is the main fire season, and July is the time of highest fire danger. In that period the grasses dry and provide a fuel source for fires, with fire conditions exacerbated by warm air temperatures and the lack of precipitation.

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[6] Pressure treating is a process used to apply a chemical preservative deep into a wood in order to protect the wood from rotting due to insects and microbial agents.

[7] Serpentinite is a rock consisting of one or more serpentine minerals formed when ultramafic rocks have been metamorphosed (ultramafic rocks are formed in high-temperature environments well below the surface of the earth), and is commonly associated with ultramafic rock along faults such as the San Andreas fault. Serpentinite commonly contains chrysotile, an asbestiform variety of the serpentine minerals. Amphibole asbestos is also found in some forms of Franciscan Complex bedrock such as blueschist.

[8] Ultramafic rocks are one type of igneous rock (formed at high temperatures well below the surface of the earth) that is rich in iron and magnesium.

The proximity of the ocean often brings moisture-laden air to the Peninsula watershed, and this moisture generally limits the ignition of wildfires. However, the movement of the fog bank also creates periods of high winds. The increased moisture, lack of grazing, and lack of extensive vegetation and fire management activities have encouraged a conversion from grass to shrubs, which have greater biomass but lower ignitability. Because the Peninsula watershed has not experienced a fire of any magnitude in over 100 years, the accumulation of fuels on watershed lands is of concern (SFPUC, 2002).

The California Department of Forestry and Fire Prevention (CalFire) has identified the entire Peninsula watershed as an area of "moderate" to "very high" fire hazard severity (CalFire, 2007). The LCSD and vicinity are located in an area of "very high" fire hazard severity, and Sampling Station #5 is located in an area of "moderate" fire hazard severity. The *Peninsula Watershed Management Plan* (WMP) (SFPUC, 2002) further characterizes areas of the watershed as "low," "moderate," or "high" fire severity areas. The LCSD and vicinity are located in a "high" fire severity area, and Sampling Station #5 is located in a "low" to "moderate" fire severity area, as shown in **Figure 5.16-1**.

5.16.2 Regulatory Framework

5.16.2.1 Federal Regulations

There are no federal regulations governing hazardous materials and wastes that are directly applicable to the proposed project.

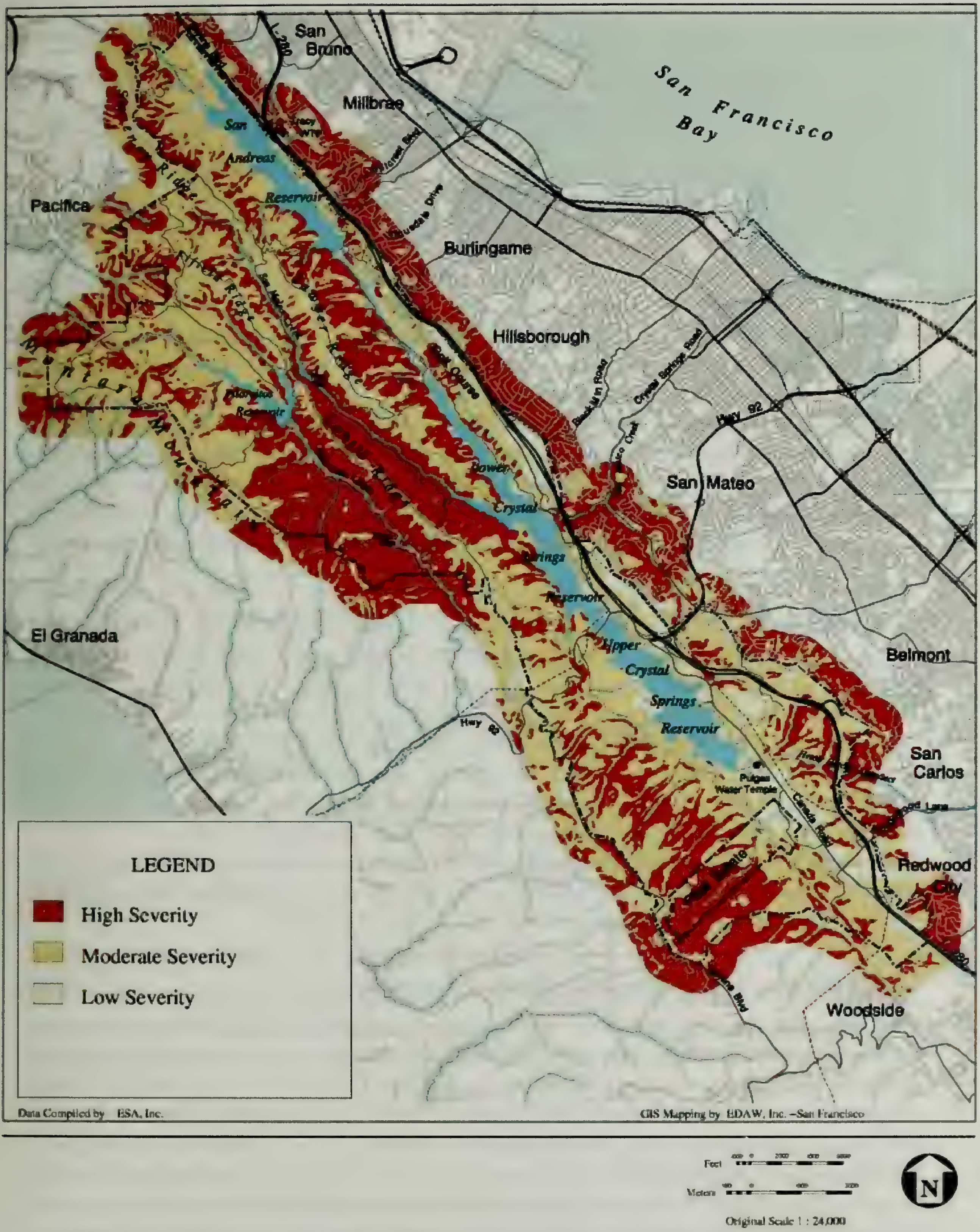
5.16.2.2 State Regulations

Definition of Hazardous Materials

Hazardous materials and wastes can result in public health hazards if released to soil, groundwater, or air. Hazardous materials, as defined in Section 25501(o) of the California Health and Safety Code, are materials that, because of their "quantity, concentration, or physical or chemical characteristics, pose a significant present or potential hazard to human health and safety or to the environment if released to the workplace or environment." Hazardous materials have been and are commonly used in commercial, agricultural, and industrial applications and to a limited extent in residential areas.

Aboveground Storage of Petroleum Products

The State Water Resources Control Board requires registration of an aboveground fuel storage tank at a construction site only if the tank is 20,000 gallons or larger, or if the aggregate volume of aboveground petroleum storage is over 100,000 gallons. As described in Section 5.15, Hydrology and Water Quality, the stormwater pollution prevention plan (SWPPP) that would be prepared for the project would address smaller temporary tanks used during construction, methods for controlling releases, and measures to clean up accidental releases and prevent the degradation of water quality (see Mitigation Measure M-HY-3, Preparation and Implementation of a SWPPP).



SOURCE: SFPUC, 2002

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.16-1
Fire Hazard Severity Map

Transportation of Hazardous Materials

Within California, the state agencies with primary responsibility for enforcing federal and state regulations regarding the transport of hazardous materials are the California Highway Patrol, the DTSC, and Caltrans. Together, federal and state agencies determine driver training requirements, load labeling procedures, and container specifications. Although certain requirements apply to the transport of hazardous materials, requirements for transporting hazardous waste are more stringent, and hazardous waste haulers must be licensed to transport hazardous waste on public roads.

Hazardous Materials Worker Safety Requirements

The California Occupational Safety and Health Administration (Cal-OSHA) is responsible for ensuring worker safety. The federal regulations for worker safety are contained in Title 29 of the Code of Federal Regulations, as authorized in the Occupational Safety and Health Act of 1970; these regulations provide standards for safe workplaces and work practices, including those related to hazardous materials handling. In California, Cal-OSHA assumes primary responsibility for developing and enforcing workplace safety regulations; Cal-OSHA standards incorporated federal OSHA regulations and are generally more stringent than federal OSHA regulations.

The state regulations concerning the use of hazardous materials in the workplace are contained in Title 8 of the California Code of Regulations (CCR), which include requirements for safety training, availability of safety equipment, accident and illness prevention programs, hazardous substance exposure warnings, and emergency action and fire prevention plan preparation. Cal-OSHA also enforces hazard communication program regulations, which contain worker safety training and hazard information requirements, such as procedures for identifying and labeling hazardous substances, communicating hazard information related to hazardous substances and their handling, and preparing health and safety plans to protect workers. A construction contractor engaged in construction activities within materials containing naturally occurring asbestos would also be required to comply with the work practices and personnel exposure monitoring requirements specified in Title 8 CCR Section 1529.

Alternative Management Standards for Treated Wood Waste

Treated wood contains hazardous chemicals at elevated levels and can be characterized as a hazardous waste under California regulations (DTSC, 2008b). However, the DTSC has developed alternative management standards that allow for disposal of treated wood as a non-hazardous waste. These standards, contained in Title 22 of the CCR, Division 4.5, Chapter 34, simplify and facilitate the safe and economical disposal of treated wood waste. They provide for less stringent storage requirements, extended accumulation periods, shipment by a non-hazardous waste hauler without a hazardous waste manifest, and disposal at specific non-hazardous waste landfills. The alternative management standards specify different management requirements for households, businesses that generate treated wood waste incidental to their normal course of business, and businesses that generate treated wood waste during their normal course of business.

Naturally Occurring Asbestos

Asbestos-containing material is defined as any material that has an asbestos content of 0.25 percent or greater (Title 17 CCR Section 93105(h)(9)). In 2001, the CARB adopted the Asbestos Airborne Toxic Control Measure (Asbestos ATCM) for Construction, Grading, Quarrying, and Surface Mining Operations in areas of serpentine and other ultramafic rocks (Title 17 CCR Section 93105), which became effective in July 2002. The ATCM protects public health and the environment by requiring the use of best available dust mitigation measures to prevent the offsite migration of asbestos-containing dust from road construction and maintenance activities, construction and grading operations, and quarrying and surface mining operations in areas of ultramafic rock, serpentine, or asbestos. The Bay Area Air Quality Management District (BAAQMD) implements the regulation. See Section 5.16.2.3, Local Regulations, for a discussion of BAAQMD requirements.

The applicability of the Asbestos ATCM for construction activities in areas of serpentine and other ultramafic rocks can be determined through a geologic investigation to analyze the concentration of naturally occurring asbestos in the rock that would be disturbed prior to construction. California Geological Survey (CGS) guidelines for the investigation of naturally occurring asbestos (CGS, 2002) require that the investigation include:

- Review of geological, soils, and vegetation references to estimate the extent of soil or rock containing naturally occurring asbestos
- Site-specific mapping of the occurrence of soil and rock containing naturally occurring asbestos
- Use of an appropriate sampling strategy to obtain the most representative information for the proposed project
- Appropriate analytical methods for naturally occurring asbestos

The geological investigation and reporting must be conducted by or under the direct supervision of a professional geologist.

Transport, Use, and Storage of Blasting Materials

The Construction Safety Orders contained in 8 CCR Section 1550 et seq. regulate the transport, use, and storage of explosive materials. In accordance with these regulations, any contractor providing blasting services must be licensed by Cal-OSHA, and explosive materials must be stored in a proper type of magazine,[9] except when they are being used, transported, or are in the custody of a carrier. All magazines must be theft- and weather-resistant and some must also be fire- and bullet-resistant. The specific type of magazine that must be used depends on the quantities and types of explosive materials that are stored, and is specified in 8 CCR Section 1562. The transfer of explosive materials must also be arranged so that no undue delay will occur between the time the explosive materials leave the magazine and the time they are used.

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[9] A magazine is a structure specifically designed for the safe storage of explosive materials.

Wildfires

The California Public Resources Code (PRC), beginning with Section 4427, includes fire safety regulations that restrict the use of equipment that may produce a spark, flame, or fire; requires the use of spark arrestors[10] on any piece of construction equipment that uses an internal combustion engine; specifies requirements for the safe use of gasoline-powered tools in fire hazard areas; and specifies fire suppression equipment that must be provided onsite for various types of work in fire-prone areas. The PRC requirements would apply to construction activities at the LCSDI project site because the dam is located in an area designated by CalFire as having a "very high" fire hazard severity, and Sampling Station #5 is in an area designated as having a "moderate" fire hazard severity.

5.16.2.3 Local Regulations

BAAQMD Asbestos Dust Requirements

The BAAQMD is the regional agency responsible for implementation of the Asbestos ATCM related to construction activities in areas of serpentine and other ultramafic rocks. For construction activities that would disturb less than one acre of land, contractors are required to implement specified dust mitigation measures before construction begins and to maintain each measure throughout the duration of the construction project to ensure that no visible dust emissions cross the property line, and that materials containing naturally occurring asbestos are not transported offsite. The dust mitigation measures include restricting construction vehicle speeds to 15 miles per hour or less; watering excavation and grading areas prior to ground disturbing activities and keeping exposed areas adequately wetted to prevent visible dust emissions from crossing the property line; actively wetting storage piles, or using a chemical suppressant or cover, to prevent dust generation when material is not being added to or removed from the pile; washing equipment prior to moving from the property to a paved public road; and cleaning visible track-out on the paved public road within 24-hours.

For construction activities that would disturb more than one acre of land, construction contractors are required to prepare an asbestos dust mitigation plan specifying measures that will be taken to ensure that no visible dust crosses the property boundary during construction. The asbestos dust mitigation plan must be submitted to and approved by the BAAQMD prior to the beginning of construction, and the site operator must ensure the implementation of all specified dust mitigation measures throughout the construction project. In addition, the BAAQMD may require air monitoring for offsite migration of asbestos dust during construction activities and may change the plan on the basis of the air monitoring results. The BAAQMD may provide an exemption from the requirements of the Asbestos ATCM if a geologic evaluation by a professional geologist determines that no serpentine or ultramafic rock is likely to be found in the area to be disturbed. CGS guidelines for investigations to analyze the concentration of naturally occurring asbestos are described above in Section 5.16.2.2, State Regulations.

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[10] A spark arrestor is a device that prohibits exhaust gases from an internal combustion engine from passing through the impeller blades where they could cause a spark. A carbon trap is commonly used to retain carbon particles from the exhaust.

San Mateo County Blasting License

Title 3 of the San Mateo County Code, Chapter 3.60, requires anyone who uses explosives to obtain a license from the San Mateo County Sheriff's Office and to implement the requirements of the license.

SFPUC Peninsula Watershed Management Plan

The Peninsula WMP provides a policy framework for the SFPUC to make management decisions about the activities, practices, and procedures that are appropriate on SFPUC lands in the Peninsula watershed. A number of actions in the WMP are intended to reduce risks from wildfires and a release of hazardous materials, including:

- *Action fir1*: Prior to authorizing the use of any vehicle or equipment on the watershed, require that SFPUC vehicles/equipment comply with the fire prevention regulations established by CDF [now CalFire] for use in the watershed. Non-SFPUC equipment must be certified by CDF. All vehicles/equipment shall include spark arrestors and carry fire suppression equipment during fire season.

- *Action haz5*: Conduct regular servicing for the SFPUC vehicle fleet and equipment so that leaks/drips/spills of contaminants are minimized. Guidelines include the following:

    - Immediately report accidental spills of hazardous materials into surface waters to the Water Quality Bureau and the appropriate state agencies.
    - Require that buckets and absorbent materials be carried in all SFPUC vehicles in case of an accident or breakdown in which vehicle-related fluids are released.
    - Follow appropriate BMPs [best management practices] in Appendix C-6 of the WMP to minimize leaching of vehicle-related contaminants into the soil or groundwater from facilities.
    - For fire protection purposes, ensure that all vehicles and equipment are equipped with spark arrestors and that each vehicle carries fire suppression equipment.

- *Action haz8*: Identify high-risk spill potential areas and implement measures (e.g., fines, barricades, etc.) to reduce the risk of hazardous spills.

- *Action haz7*: Develop spill response and containment measures for SFPUC vehicles on the watershed. These measures should be coordinated with the overall Emergency Response Plan developed in Action saf7.

5.16.3 Impacts and Mitigation Measures

5.16.3.1 Significance Criteria

The City and County of San Francisco has not formally adopted significance standards for impacts related to hazards, but generally considers that implementation of the proposed project would have a significant impact related to hazards or hazardous materials if it were to:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
- Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school;
- Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, create a significant hazard to the public or the environment;
- For a project located within an area covered by an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, result in a safety hazard for people residing or working in the project area;
- For a project within the vicinity of a private airstrip, result in a safety hazard for people residing or working in the project area;
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or
- Expose people or structures to a significant risk of loss, injury, or death involving fires.

Due to the nature of the proposed project, impacts related to the following criteria are not discussed for the reasons described below:

> *Routine Transport, Use, or Disposal of Hazardous Materials*. Operation of the proposed project would not result in any change in the use or disposal of any hazardous materials at the LCSD or Sampling Station #5. Although a number of hazardous materials would be used during construction, these uses would be temporary and would not constitute routine transport, use, or disposal of hazardous materials. Therefore, the criterion related to the routine transport, use, or disposal of hazardous materials is not applicable.
>
> *Use or Emission of Hazardous Materials Within One-Quarter Mile of a School*. The nearest schools to the LCSDI project area are Odyssey Middle School on Polhemus Road, which is located approximately 4,000 feet northeast of the LCSD, and Highlands Elementary on Bunker Hill Drive, approximately 3,500 feet southeast of the LCSD. Because the project is located more than one-quarter mile from a school and would not include the routine use of hazardous materials, the criterion related to the use or emission of hazardous materials within one-quarter mile of a school is not applicable.
>
> *Safety Hazards in the Vicinity of an Airport*. The nearest airports to the proposed project are the San Carlos Airport, located approximately four miles east of Sampling Station #5 and six miles southeast of the LCSD, and the San Francisco International Airport, approximately six miles northeast of LCSD. There are no private airports in the vicinity of the proposed project. Because the project is located more than two miles from an airport

and would not involve construction of aboveground structures that could interfere with air traffic, the criterion related to safety hazards in the vicinity of an airport is not applicable.

Impair Implementation of or Physically Interfere with an Emergency Response Plan or Emergency Evacuation Plan. The temporary closure of a section of Skyline Boulevard during project construction could potentially interfere with emergency access. Potential impacts on emergency access and emergency service providers are evaluated in Section 5.6, Transportation and Circulation, Impact TR-1. Please refer to Section 5.6 for the pertinent discussion. This criterion is not discussed further in this section.

5.16.3.2 Approach to Analysis

This analysis focuses on the potential to encounter hazardous substances in soil and groundwater during construction and is based on a regulatory database review to identify permitted hazardous materials uses and environmental cases that could affect project area soil and groundwater. The analysis also addresses the potential for the project to encounter soil and rock containing naturally occurring asbestos; result in a release of hazardous materials from construction equipment; or create fire hazards. Each potential impact is assessed in terms of the applicable regulatory measures, and mitigation measures are identified as appropriate.

5.16.3.3 Impact Summary

Table 5.16-1 summarizes the results of the hazards impact assessment.

TABLE 5.16-1
SUMMARY OF IMPACTS – HAZARDS AND HAZARDOUS MATERIALS

	Significance Determination	
Impact	**LCSD Site**	**Sampling Station Site**
Impact HZ-1: Potential to encounter hazardous materials in soil and groundwater.	LS	LS
Impact HZ-2: Exposure to naturally occurring asbestos.	SM	LS
Impact HZ-3: Exposure to hazardous building materials.	SM	LS
Impact HZ-4: Accidental hazardous materials release from construction equipment.	PSM	PSM
Impact HZ-5: Risk of fires during construction.	LS	LS
Impact HZ-6: Fire and safety hazards from the use of explosives during construction.	LS	N/A
Impact HZ-7: Operational impacts related to hazards and hazardous materials.	LS	N/A
Impact C-HZ: Cumulative impacts related to hazards and hazardous materials.	LS	LS

B = Beneficial impact
N/A = Not Applicable or no impact
LS = Less than Significant impact, no mitigation required
SM = Significant impact, can be Mitigated to less than significant
PSM = Potentially Significant impact, can be Mitigated to less than significant
SU = Significant Unavoidable impact
PSU = Potentially Significant Unavoidable impact

5.16.3.4 Construction Impacts

Impact HZ-1: Potential to encounter hazardous materials in soil and groundwater.

Lower Crystal Springs Dam Vicinity

As discussed in Section 5.16.1, Setting (see Section 5.16.1.1, Potential Presence of Hazardous Materials in Soil and Groundwater), the environmental database review for the LCSD area did not identify any permitted hazardous materials uses or environmental cases within the project area that could potentially affect soil or groundwater quality. Caltrans experienced a release of a small amount of lead during a seismic retrofit of the I-280 bridge above the project area. However, based on records indicating that more than 45 tons of soil was transported off site for disposal, that release was likely cleaned up at the time it occurred and would have a low potential to affect soil quality within the project area. Therefore, there is a low potential to encounter hazardous materials in the soil and groundwater during construction in the LCSD vicinity. Impacts related to this topic would be *less than significant*, and no mitigation is required.

Sampling Station #5 Vicinity

Modifications to Sampling Station #5 would require limited excavation for construction of the footings for the new steel-frame structure. However, as discussed in Section 5.16.1.1, the environmental database review for this area did not identify any permitted hazardous materials uses, environmental cases, or spill sites with the potential to affect soil or groundwater quality in this vicinity. Therefore, there is a low potential to encounter hazardous materials in the soil and groundwater during construction at Sampling Station #5. Impacts related to this topic would be *less than significant*, and no mitigation is required.

Impact HZ-2: Exposure to naturally occurring asbestos.

Lower Crystal Springs Dam Vicinity

As discussed in Section 5.16.1, Setting, Franciscan Complex mélange and serpentinite commonly contains naturally occurring asbestos, a fibrous mineral that can be a human health hazard if it becomes airborne, in the form of chrysotile (from the serpentine mineral group) or amphibole asbestos (including crocidolite). Excavation of bedrock comprised of mélange or serpentinite as well as alluvial and fill materials derived from this bedrock could release naturally occurring asbestos, potentially exposing onsite workers and the public to airborne asbestos, unless appropriate control measures are implemented.

The proposed project includes construction activities in areas that potentially contain naturally occurring asbestos, including: excavation and possibly blasting for the stilling basin within alluvial materials and mélange of Franciscan Complex bedrock; grading for construction of the temporary access road adjacent the stilling basin within alluvial materials derived from Franciscan Complex bedrock; grading for Staging Area 7 within artificial fill that could have been derived from Franciscan Complex bedrock; and grading for the access road to the boat ramp at Staging Area 9 within serpentinite of the Franciscan Complex. The total area of disturbance for these activities would be more than one acre. Because rock containing naturally occurring asbestos would be encountered during construction, impacts related to exposure to naturally occurring asbestos during construction would be *significant* and the requirements of the Asbestos ATCM, described in Section 5.16.2, Regulatory Framework, would apply.

However, as discussed in Section 5.14, Geology and Soils, bedrock in the immediate LCSD vicinity is comprised of greywacke with some zones of shale and some shear zones. Because the bedrock is predominantly composed of sandstone, which does not typically contain naturally occurring asbestos at substantial concentrations, it is possible that some of the rock that would be disturbed would contain less than 0.25 percent naturally occurring asbestos. The applicability of the Asbestos ATCM could be determined through a geologic investigation to analyze the concentration of naturally occurring asbestos in the rock that would be disturbed prior to construction. Therefore, impact related to exposure to naturally occurring asbestos during construction would be reduced to a less-than-significant level with implementation of Mitigation Measures M-HZ-2a (Conduct Investigation for Naturally Occurring Asbestos) and M-HZ-2b (Asbestos Dust Mitigation Plan). Mitigation Measure M-HZ-2a requires the SFPUC to conduct a geologic investigation to determine the concentration of naturally occurring asbestos in the rock that would be disturbed prior to construction, and to file an application for exemption from the requirements of the Asbestos ATCM if the investigation does not identify rock containing naturally occurring asbestos. Mitigation Measure M-HZ-2b requires that the SFPUC implement an asbestos dust mitigation plan in accordance with the Asbestos ATCM to ensure that no visible dust crosses the work area boundaries, and conduct air monitoring to demonstrate compliance with this criterion if deemed necessary by the BAAQMD. Alternatively, the SFPUC could elect to implement Mitigation Measure M-HZ-2b, without implementing Mitigation Measure M-HZ-2a, which would afford the same level of protection during construction because the dust control measures would prevent exposure to project-related dust outside of the work area, regardless of the asbestos content of the dust. Rock containing naturally occurring asbestos that would be disposed of offsite would not be considered a hazardous waste under California regulations (DTSC, 2000).

Sampling Station #5 Vicinity

Sampling Station #5 is located within alluvial fan and fluvial deposits that may have also been derived, at least partially, from Franciscan Complex mélange; however, impacts related to exposure to naturally occurring asbestos at this site would be *less than significant* because only a limited amount of excavation (approximately 7 cubic yards) would be required for construction of footings for the new steel-frame structure, and excavation would not disturb substantial amounts of naturally occurring asbestos.

Impact HZ-3: Exposure to hazardous building materials.

Lower Crystal Springs Dam Vicinity

As discussed in Section 5.16.1.2, Existing Hazardous Building Materials, approximately 35 of the stoplogs that would be removed during renovation of the dam consist of pressure treated wood. During removal, workers and the public could be exposed to unsafe levels of wood treatment chemicals if these stoplogs are not appropriately managed and disposed of during construction, a *significant* impact. This impact would be reduced to a less-than-significant level with implementation of Mitigation Measure M-HZ-3, Implement DTSC Alternative Management Standards for Treated Wood Waste requiring the SFPUC to implement regulatory requirements for the management of treated wood waste, described in Section 5.16.2, Regulatory Framework. Implementation of this measure would ensure that the SFPUC appropriately manages the treated wood waste in a manner that does not cause a release of wood preservative chemicals and legally disposes of the stoplogs at a permitted disposal facility. Likely disposal sites for the stoplogs are the Altamont Landfill and Resource Recovery Facility, Keller Canyon Landfill, Santa Cruz Class III Landfill, Buena Vista Drive Sanitary Landfill, and the City of Watsonville Landfill because there are no certified treated wood waste landfills in San Mateo County (DTSC, 2008a).

The project would not disturb hazardous building materials during other demolition activities because the structures that would be demolished or modified at the LCSD (the existing training walls, stilling basin, and portions of the parapet wall and spillway) do not contain hazardous building materials such as lead-based paint, PCBs, or asbestos. Therefore impacts related to exposure to hazardous building materials would be *less than significant* during demolition or modification of these structures.

Sampling Station #5 Vicinity

Although Sampling Station #5 could include lead-based paint, the station would raised by detaching the existing sampling station from the discharge channel, constructing a new steel-frame structure, and mounting the sampling station on the new frame, as described in Chapter 3, Project Description. These activities would not disrupt substantial amounts of lead-based paint, if present. Therefore, impacts related to exposure to hazardous building materials would be *less than significant*, and no mitigation is required.

Impact HZ-4: Accidental hazardous materials release from construction equipment.

Lower Crystal Springs Dam and Sampling Station #5 Vicinities

Hazardous materials expected to be used during construction activities include fuels, lubricants, paints, and solvents. Storage and use of hazardous materials at the construction site and staging areas could result in the accidental release of small quantities of hazardous materials, which could degrade soil and groundwater quality, and/or surface water quality in lower San Mateo Creek or the Pulgas Discharge Channel. This impact would be *potentially significant*. As discussed in

Impact HY-1 in Section 5.15, Hydrology and Water Quality, impacts related to a potential release of hazardous materials during construction would be reduced to a less-than-significant level with implementation of Mitigation Measure M-HY-3 (Preparation and Implementation of a SWPPP); this measure requires the implementation of site-specific, construction best management practices (BMPs) as specified in the SWPPP. BMPs that address a release of hazardous materials include:

- Place drip pans under construction vehicles and all parked equipment
- Check construction equipment for leaks regularly
- Wash construction equipment in a designated enclosed area regularly
- Contain vehicle and equipment wash water for percolation or evaporative drying away from storm drain inlets and to prevent runoff into Crystal Springs Reservoir, San Mateo Creek, and the Pulgas Discharge Channel
- With the exception of vehicles and equipment on barges in Crystal Springs Reservoir, refuel all other vehicles and equipment at least 50 feet away from San Mateo Creek, Crystal Springs Reservoir, the Pulgas Discharge Channel, and other water bodies to minimize the risk of run-on, runoff, and spills that could affect waterbodies
- Contain fueling areas to prevent run-on and runoff and to contain spills
- Cover all storm drain inlets when paving or applying seals or similar materials to prevent the offsite discharge of these materials
- Store all hazardous materials in an area protected from rainfall and stormwater run-on and prevent the offsite discharge of leaks or spills
- Minimize the potential for contamination of Crystal Springs Reservoir, San Mateo Creek, and the Pulgas Discharge Channel by maintaining spill containment and cleanup equipment onsite, and by properly labeling and disposing of hazardous wastes
- Locate waste collection areas close to construction entrances and away from roadways, storm drains, Crystal Springs Reservoir, San Mateo Creek, and the Pulgas Discharge Channel
- Inspect dumpsters and other waste and debris containers regularly for leaks and remove and properly dispose of any hazardous materials and liquid wastes placed in these containers
- Train construction personnel in proper material delivery, handling, storage, cleanup, and disposal procedures

Impact HZ-5: Risk of fires during construction.

Lower Crystal Springs Dam Vicinity

The use of construction equipment, temporary onsite storage of diesel fuel, and the potential use of explosives poses a wildfire risk that could injure workers and the public. CalFire has mapped the area around the LCSD as having a "very high" fire hazard severity, and construction would occur in areas identified in the Peninsula WMP as having a "high" fire severity. The time of the greatest fire danger would be during the clearing phase, when people and machines are working in vegetated areas that can be highly flammable. If piled onsite, the cleared dry vegetation could also become a fire fuel.

Potential sources of ignition include equipment with internal combustion engines, gasoline-powered tools, and equipment or tools that produce a spark, fire, or flame. Such sources include sparks from blades or other metal parts scraping against rock, overheated brakes on wheeled equipment, heated emissions-control devices or vehicles, friction from worn or unaligned belts and drive chains, and burned-out bearings or bushings. Sparking as a result of scraping against rock is difficult to prevent. The other hazards result primarily from poor maintenance of the equipment. Smoking by construction personnel is also a potential source of ignition during construction.

Regulations governing the use of construction equipment in fire-prone areas are designed to minimize the risk of wildfires during construction activity. In accordance with the PRC, the construction contractor would be required to comply with the following legal requirements during construction:

- Earthmoving and portable equipment with internal combustion engines would be equipped with a spark arrestor to reduce the potential for igniting a wildfire (PRC Section 4442).

- Appropriate fire suppression equipment would be maintained during the highest fire danger period – from April 1 to December 1 (PRC Section 4428).

- On days when a burning permit is required, flammable materials would be moved to a distance of 10 feet from any equipment that could produce a spark, fire, or flame, and the construction contractor would maintain the appropriate fire suppression equipment (PRC Section 4427).[11]

- On days when a burning permit is required, the appropriate fire suppression equipment would be maintained when portable tools powered by gasoline-fueled internal combustion engines would be used within 25 feet of any flammable materials (PRC Section 4431).

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[11] The project would not require a burning permit, but these restrictions would apply when burning permits would be required for projects that do involve burning. This time period would be from May 1 to a date specified by CalFire when the Department has determined that hazardous fire conditions have abated for that year. CalFire may also declare that unusual fire hazard conditions exist in the area at any time during the year and impose these requirements.

Implementation of the proposed project would be undertaken in accordance with Action fir1 of the SFPUC's Peninsula WMP, as discussed in Section 5.16.2, Regulatory Framework. Therefore, assuming that the contractors would implement the requirements of the PRC pertaining to fire safety in a wildland area, and that the SFPUC would implement the fire safety provisions of the Peninsula WMP, this impact would be *less than significant*, and no mitigation is required.

Sampling Station #5 Vicinity

CalFire has mapped the area around Sampling Station #5 as having a "moderate" fire hazard severity, and construction would occur in areas identified in the Peninsula WMP as having a "low" to "moderate" fire severity. Although the risk of fire from construction activities would be lower than in the LCSD vicinity, construction would still present a risk of wildfire. However, compliance with the legal requirements of the PRC governing the use of construction equipment in fire-prone areas as indicated in Action fir1 of the Peninsula WMP would ensure that impacts related to wildfires would be *less than significant*, and no mitigation is required.

Impact HZ-6: Fire and safety hazards from the use of explosives during construction.

Lower Crystal Springs Dam Vicinity

As indicated in Chapter 3, Project Description, construction activities could require blasting (controlled detonation) and the use of explosives. The Construction Safety Orders implemented by Cal-OSHA regulate the transport, use, and storage of explosive materials, as described in Section 5.16.2, Regulatory Framework. In accordance with the Construction Safety Orders, the contractor would be required to store the explosives in appropriate magazines and to transport and transfer the explosives in accordance with applicable regulations. The SFPUC and independent inspectors would continuously monitor the work for strict compliance with contract safety provisions and regulatory requirements. Careful implementation of these safety measures would ensure minimal risk to workers and the public. Further, the SFPUC would identify the appropriate notification and coordination requirements of the San Mateo County Sheriff's Office when it is determined whether blasting would be required. By complying with these requirements for explosives handling, impacts related to the use of explosives would be *less than significant*, and no mitigation is required.

Sampling Station #5 Vicinity

Construction activities at Sampling Station #5 would not require blasting or the use of explosives. Therefore, impacts related to fire and safety hazards from the use of explosives during construction are *not applicable* to this site.

5.16.3.5 Operational Impacts

Impact HZ-7: Operational impacts related to hazards and hazardous materials.

Lower Crystal Springs Dam Vicinity

Following completion of the LCSDI project, operation of the dam and reservoir would be essentially the same as existing operations, and maintenance and repairs would occur as needed. While project facilities would be inspected regularly in accordance with the standard inspection schedule, the type of inspection or maintenance activities would not substantially change from current practices. Operation and maintenance of the improved dam and sampling station would not require a substantial increase in the use of hazardous materials or result in any of the hazards discussed above. Therefore, this impact would be *less than significant*.

Sampling Station #5 Vicinity

At Sampling Station #5, post-construction operations and maintenance would continue the same as current practices. Therefore, there would be *no impact* at this site.

5.16.3.6 Mitigation Measures

Mitigation Measure M-HZ-2a: Conduct Investigation for Naturally Occurring Asbestos.

To determine the applicability of the Asbestos ATCM, the SFPUC shall conduct a soils investigation in accordance with the California Geological Survey's Special Publication 124, *Guidelines for Investigations of Naturally Occurring Asbestos in California* (CGS, 2002). The investigation shall include:

- Review of geological, soils, and vegetation references to estimate the extent of soil or rock containing naturally occurring asbestos
- Site-specific mapping of the occurrence of soil and rock containing naturally occurring asbestos
- Use of an appropriate sampling strategy to obtain the most representative information for the proposed project
- Appropriate analytical methods for naturally occurring asbestos

The geological investigation and reporting shall be conducted by or under the direct supervision of a professional geologist, and it is preferable for mapping to be conducted by or under the direct supervision of a certified engineering geologist.

If the geological investigation finds that construction activities would not encounter rock containing greater than 0.25 percent naturally occurring asbestos, the SFPUC shall submit a copy of the report to the BAAQMD with an application for exemption from the requirements of the

Asbestos ATCM. If the geologic investigation finds that construction would encounter rock containing greater than 0.25 percent naturally occurring asbestos, then the SFPUC shall implement Mitigation Measure M-HZ-2b (Asbestos Dust Mitigation Plan).

Mitigation Measure M-HZ-2b: Asbestos Dust Mitigation Plan.

If the investigation completed in accordance with Mitigation Measure M-HZ-2a (Conduct Investigation for Naturally Occurring Asbestos) finds that rock containing greater than 0.25 percent naturally occurring asbestos would be disturbed during construction in the LCSD vicinity, the SFPUC or its construction contractor shall submit the appropriate notification forms and prepare an asbestos dust mitigation plan specifying measures that will be taken to ensure that no visible dust crosses the work limits during construction. The plan must specify the following measures:

- Prevent and control visible track-out from the work area
- Ensure adequate wetting or covering of active storage piles
- Control disturbed surface areas and storage piles that would remain inactive for 7 days
- Control traffic on on-site unpaved roads, parking lots, and staging areas, including a maximum vehicle speed of 15 miles per hour
- Control earthmoving activities
- Control offsite transport of dust emissions that contain naturally-occurring asbestos-containing materials
- Stabilize disturbed areas following construction

The asbestos dust mitigation plan shall be submitted to and approved by the BAAQMD prior to the beginning of construction, and as provided for in the Asbestos ATCM, alternative measures that provide an equivalent level of dust control may be included in the Dust Mitigation Plan subject to BAAQMD authorization. The construction contractor(s) must ensure the implementation of all approved dust mitigation measures throughout the construction project. In addition, if required by the BAAQMD, the SFPUC or a qualified third party consultant shall conduct air monitoring for offsite migration of asbestos dust during construction activities and shall modify the dust mitigation plan on the basis of the air monitoring results if necessary.

Mitigation Measure M-HZ-3: Implement DTSC Alternative Management Standards for Treated Wood Waste.

The SFPUC will implement the requirements of the DTSC Alternative Management Standards for Treated Wood Waste. In accordance with these standards, employees who handle the treated wood waste or would otherwise be expected to come into contact with the waste will be trained in the applicable regulations related to the handling of treated wood waste. Because the treated wood waste will be generated incidental to normal SFPUC business operations, it will be segregated from other wastes, appropriately labeled, and transported to an authorized treated wood waste disposal facility in accordance with the alternative management standards. The treated wood waste will not be burned, scavenged, or stored in contact with the ground. The SFPUC will not store more than 1,000 pounds of treated wood waste for longer than 30 days, and will identify the treated wood waste to the disposal facility personnel upon disposal. Reuse of these stoplogs will not be allowed unless they are reused on site, or if the use is consistent with allowable reuses for the wood treatment chemicals used on the stoplogs. If the stoplogs are altered in anyway, the SFPUC or contractor will handle them in a way that prevents the uncontrolled release of hazardous constituents to the environment, and any resulting sawdust or other particles smaller than one cubic inch will be captured and managed as treated wood waste.

Mitigation Measure M-HY-3: Preparation and Implementation of a SWPPP.

(See Section 5.15, Hydrology and Water Quality.)

5.16.3.7 Cumulative Impacts

Impact C-HZ: Cumulative impacts related to hazards and hazardous materials.

The geographic scope of potential cumulative impacts associated with hazards and hazardous materials encompasses the project area and immediate vicinity, because hazardous materials effects are generally limited to site-specific conditions.

Potential impacts related to hazardous materials in soil and groundwater, exposure to naturally occurring asbestos, accidental release of hazardous materials from construction equipment, risk of fires, and fire and safety hazards from the use of explosives during construction are also restricted to the project area and immediate vicinity, but cumulative construction impacts could occur if the project area overlapped with that of a cumulative project.

Of the cumulative projects listed in Table 5.1-1, the project areas of the Crystal Springs Dam Bridge Replacement project, the Crystal Springs/San Andreas (CSSA) Transmission Upgrade project, and the Crystal Springs Pipeline No. 2 (CSPL2) Replacement project would overlap geographically with the LCSDI project's construction and staging areas at the LCSD vicinity. The Pulgas Discharge Channel Modifications project would overlap geographically with the LCSDI project at the Sampling Station #5 vicinity. As described in Chapter 3, Project Description (see Section 3.8, Coordination with Other Local Projects), San Mateo County would demolish the existing bridge before construction of the dam improvements and would construct the replacement bridge after completion of the LCSDI project. The construction schedules for the CSSA Transmission Upgrade project and CSPL2 Replacement project would overlap with the schedule for the LCSDI project in 2011.

Impacts related to exposure to hazardous materials in soil and groundwater could occur if the cumulative projects involved excavation or dewatering within contaminated soil or groundwater.

However, as discussed in Impact HZ-1, there would be a low potential to encounter hazardous materials in the soil and groundwater during construction of the proposed project. Because the environmental database reviews completed for the proposed project did not identify any permitted hazardous materials uses or environmental cases in the vicinity of the project components that are likely to have adversely affected soil and groundwater quality, the LCSDI project's contribution to cumulative impacts related to exposure to hazardous materials in soil and groundwater would not be cumulatively considerable (*less than significant*).

Impacts related to exposure to naturally occurring asbestos could occur if the cumulative projects involved excavation within Franciscan Complex mélange; alluvium, colluvium, or fill derived from this bedrock; or other rock types containing naturally occurring asbestos such as serpentinite. Although the proposed project as well as the CSSA Transmission Upgrade project and CSPL2 Replacement project would involve excavation in Franciscan Complex mélange, or alluvium, colluvium, or fill derived from this bedrock, all of the projects would be required to comply with the Asbestos ATCM, which specifies that no visible dust may cross the property boundary (or work limit, as specified in Mitigation Measure M-HZ-2b, Asbestos Dust Mitigation Plan). The BAAQMD may require air monitoring to ensure compliance with this criterion for projects that would disturb over one acre of rock containing naturally occurring asbestos. Because all three projects would be required to comply with the asbestos ATCM and to take corrective action should visible dust cross the project boundary, the LCSDI project's contribution to cumulative impacts related to exposure to naturally occurring asbestos would not be cumulatively considerable (*less than significant*).

Construction activities for the LCSDI project in the vicinity of the LCSD could occur concurrently with the CSSA Transmission Upgrade project and the CSPL2 Replacement project. Construction activities at the Sampling Station #5 would occur concurrently with construction of the Pulgas Discharge Channel Modifications project. Because these projects would include the use of construction equipment adjacent to or near San Mateo Creek and the Pulgas Discharge Channel, there would be a potential cumulative impact related to an accidental release of hazardous materials from construction equipment. However, all of these overlapping projects are proposed by the SFPUC and each project would include implementation of a SWPPP, as required by the San Francisco Bay Regional Water Quality Control Board as specified in Mitigation Measure M-HY-3 (Preparation and Implementation of a SWPPP). The SWPPP would specify measures to be implemented for the protection of water quality, including, for example, inspections, BMPs, and scheduling and monitoring requirements. Consequently, the LCSDI project's contribution to this potential cumulative impact would not be cumulatively considerable with implementation of Mitigation Measure M-HY-3 (*less than significant*).

The proposed project and all of the overlapping projects are located in an area mapped by CalFire as having a "moderate" to "very high" wildfire severity, and identified in the Peninsula WMP as having "low" to "high" fire severity. Construction of these projects could incrementally increase the potential for wildfires during construction, particularly when construction schedules overlap during the season of highest fire danger. Although project-specific impacts would be reduced to a less-than-significant level with compliance with the provisions of the PRC, cumulative impacts related to increased fire risk would be significant, because the cumulative increase in fire risk during overlap of San Mateo County's Crystal Springs Dam Bridge Replacement project and the four SFPUC projects could place an additional burden on the local fire service provider and put the public at greater risk from fire unless adequate emergency response services are ensured. However, the project-specific impact related to an increased fire risk would be reduced to a less-than-significant level with implementation of Mitigation Measure M-TR-1 (Traffic Control Plan), which requires that the SFPUC notify emergency service providers, including fire departments, of the temporary road closures and detours as part of each project's traffic control plan. With the specified mitigation, the fire departments could adequately plan for the increased fire risk, and the LCSDI project would not contribute to a cumulative impact related to an increased fire risk. Therefore, the project's contribution to this potential cumulative impact would not be cumulatively considerable (*less than significant*).

The proposed project could involve the use of explosives, which would increase fire and safety hazards during construction. Other SFPUC projects in the area, such as the New Crystal Springs Bypass Tunnel (NCSBT) project, could also require the use of explosives. However, because the NCSBT construction schedule indicates blasting activities would be completed prior to the LCSDI project's potential use of blasting, the project's contribution this cumulative impact would not be cumulatively considerable (*less than significant*).

5.16.4 References

California Department of Forestry and Fire Protection (CalFire), Fire Hazard Severity Zones in SRA. Adopted by CalFire on November 7, 2007. Available online at http://frap.cdf.ca.gov/webdata/maps/san_mateo/fhszs_map.41.pdf.

California Geological Survey (CGS), Guidelines for Geologic Investigations of Naturally Occurring Asbestos in California. Special Publication 124, 2002.

Department of Toxic Substances Control (DTSC), Letter to Jon A. Morgan, Director, Environmental Management Department, County of El Dorado, Naturally Occurring Asbestos, January 20, 2000.

Department of Toxic Substances Control (DTSC), List of RWQCB Certified Treated Wood Waste Landfills, July, 2008a.

Department of Toxic Substances Control (DTSC), Fact Sheet, Requirements for Generators of Treated Wood Waste (TWW), December, 2008b.

Environmental Data Resources (EDR), EDR Radius Map with GeoCheck; Half Moon Bay, CA, 94019, Inquiry Number: 1854897.1s, February 12, 2007a.

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San Francisco Public Utilities Commission (SFPUC), Peninsula Watershed Management Plan. Prepared by EDAW, Inc., Spring 2002.

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5.17 Mineral and Energy Resources

This section analyzes the potential impacts on mineral and energy resources that could occur during construction and operation of the proposed Lower Crystal Springs Dam Improvements (LCSDI) project and assesses the potential for project implementation to adversely affect such resources.

5.17.1 Setting

5.17.1.1 Mineral Resources

The San Mateo County General Plan identifies and describes mineral resources in the unincorporated areas of the county. No mineral deposits or other mineral resources are identified in the LCSDI project area (San Mateo County, 1986).

5.17.1.2 Energy

California's Electricity Supply

California's electricity is supplied by a number of sources, including natural gas (45.7 percent), coal (18.2 percent), large hydroelectric plants (11 percent), and nuclear (14.4 percent) (CEC, 2009). The remaining 10.6 percent is classified as renewable energy, which is supplied by geothermal, biomass, small hydroelectric, wind, and solar sources.

In 2002, California imposed a requirement that companies supplying electrical power in the state must increase procurement of eligible renewable energy resources by at least 1 percent per year so that 20 percent of their retail sales are obtained from renewable resources by 2017 (Public Utilities Code, Section 399.15). Publicly owned utilities have been asked to consider establishing a similar target. This requirement was revised by Executive Order S-14-08, which requires all retail sellers of electricity in California to serve 33 percent of their electrical load from renewable energy sources by 2020.

SFPUC Power Enterprise

The SFPUC's power services consist of hydropower generated through the Hetch Hetchy water system and supplied to municipal entities, including city buildings, the Municipal Transportation Agency, and San Francisco International Airport. The SFPUC Power Enterprise (formerly Hetch Hetchy Water and Power) provides hydropower through a system of dams, hydroelectric plants, reservoirs, aqueducts, pipelines, and transmission lines operated by the SFPUC.

The SFPUC Power Enterprise generates up to 400 megawatts of hydroelectric power at plants on the Tuolumne River, and electric power is distributed via 150 miles of high-voltage transmission lines linking Hetch Hetchy power to California's electricity grid in the city of Newark. Energy production varies by season and by year depending on hydrological conditions. The long-term annual average production is approximately 1.7 billion kilowatt-hours (kWh); historical production has ranged from a low of 1.2 billion kWh per year to a high of 2.2 billion kWh per year (SFPUC, 2002). The Power Enterprise focuses on providing adequate and reliable supplies of electric power to meet the municipal requirements of the City and County of San Francisco (CCSF), including power to operate Muni streetcars and electric buses, street and traffic lights, municipal buildings and other City facilities, including the Airport. Power is also provided to the Modesto and Turlock Irrigation Districts, and to other commercial customers consistent with prescribed contractual obligations and federal law.

Through an interconnection agreement, regulated by the Federal Energy Regulatory Commission, between the SFPUC and Pacific Gas and Electric Company (PG&E), PG&E provides SFPUC with transmission and distribution services from points of interconnection from Warnerville and Newark to their customers.

In addition to supplying power to the Hetch Hetchy water transmission facilities and San Francisco municipal entities, SFPUC Power Enterprise also sells electricity to Norris Industries, a federal facility; provides electricity for the municipal and agricultural pumping loads of the Modesto and Turlock Irrigation Districts; and sells electricity to other public agency wholesalers. Although the quantity of power produced exceeds San Francisco's municipal power needs on an annual basis, the CCSF must supplement its power sources to meet municipal demand and its contractual obligations during the summer and fall months, when power generation is reduced so that water can be stored.

Existing energy usage by the SFPUC regional water system, including energy use by the Lower Crystal Springs Dam facilities, is nearly 44 million kWh per year, and virtually all of the energy comes from the Hetch Hetchy system. This amount is less than 4 percent of the energy produced by the Hetch Hetchy system (the historical low energy production rate), and less than 3 percent of the long-term annual average production rate (SFPUC, 2008). However, during low hydro-generating periods, the City purchases power from the Western Systems Power Pool.

Pacific Gas and Electric Company

Pacific Gas and Electric Company (PG&E) supplies natural gas and electricity to most of northern California. It provides the SFPUC Power Enterprise with transmission and distribution services pursuant to an interconnection agreement regulated by the Federal Energy Regulatory Commission. Under this agreement, PG&E transmits and distributes electricity to SFPUC Power Enterprise customers. However, PG&E does generally provide power for the SFPUC regional water system, including the Lower Crystal Springs Dam (LCSD) facilities.

5.17.2 Regulatory Framework

5.17.2.1 Federal Regulations

There are no federal regulations governing mineral and energy resources that apply to the LCSDI project.

5.17.2.2 State Regulations

Minerals

Surface Mining and Reclamation Act of 1975

Pursuant to the Surface Mining and Reclamation Act of 1975 (SMARA), the California Geological Survey (CGS) has evaluated areas of California for mineral resource potential and has classified the land accordingly. One of the objectives of SMARA is to identify areas of the state that contain significant mineral resources so these lands can be set aside for uses that are compatible with possible future mining. Natural resources that are identified include air, minerals, water, sand and gravel, timber, energy, and other resources used for construction and operation. Under SMARA, protected mineral resources include construction materials, industrial and chemical mineral materials, metallic and rare minerals, and non-fluid mineral fuels. Non-fuel mineral resources include metals such as gold, silver, iron, and copper; industrial minerals such as boron compounds, rare-earth elements, clays, limestone, gypsum, salt, and dimension stone; and construction aggregate, which includes sand, gravel, and crushed stone.

In the land classification scheme adopted by the CGS, three types of Mineral Resource Zones (MRZs) are identified: MRZ-1 for areas of no mineral resource significance; MRZ-2 for areas identified as having mineral resource significance; and MRZ-3 for areas containing mineral resources that cannot be classified as significant due to inadequate data. A fourth zone, MRZ-4, corresponds to areas where no known minerals occur, and where geologic information is unavailable to make a definite determination as to the area's mineral potential. No known mineral resources pursuant to SMARA were identified in or adjacent to the LCSD or Sampling Station #5 project sites (CDMG, 1987).

Energy Resources

California Energy Action Plan

The California Energy Commission (CEC) and the California Public Utilities Commission (CPUC) adopted the *State of California Energy Action Plan* (Consumer Power and Conservation Financing Authority, CEC, and CPUC, 2003) and the *Energy Action Plan II* (CPUC and CEC, 2005). The goal of the plan is to ensure that adequate, reliable, and reasonably priced electrical power and natural gas supplies, including prudent reserves, are achieved and provided through policies, strategies, and actions that are cost-effective, affordable, technologically advanced, and environmentally sound for California's consumers and taxpayers. The plan also establishes specific actions to meet this goal. In accordance with this plan, the first-priority actions to address California's increasing energy demands are energy efficiency and demand response. Additional priorities include using renewable sources of power, developing distributed generation, and improving the reliability of energy infrastructure. To the extent that these actions are unable to satisfy the increasing energy and capacity needs, clean and efficient fossil-fired generation is supported. The *Energy Action Plan II* includes the following energy efficiency action specific to water supply systems:

- Identify opportunities and support programs to reduce electricity demand related to the water supply system during peak hours, and opportunities to reduce the energy needed to operate water conveyance and treatment systems

In 2008, the CPUC and the CEC adopted the *Energy Action Plan Update*, which examines the state's ongoing actions in the context of global climate change (CEC and CPUC, 2008). The purpose of the *Energy Action Plan Update* is to capture recent changes in policy and describe intended activities to accomplish those policies; it does not assume that work under the 2003 *Energy Action Plan* or 2005 *Energy Action Plan II* is complete. The *Energy Action Plan Update* describes nine major action areas identified in the previous plans, and for each action area lists accomplishments and next steps. The actions areas include:

- Energy efficiency
- Demand response
- Renewable energy
- Electricity adequacy, reliability, and infrastructure
- Electricity market structure
- Natural gas supply, demand, and infrastructure
- Transportation fuels supply, demand, and infrastructure
- Research, development, and demonstration
- Climate change

5.17.2.3 Local Regulations

There are no local regulations governing mineral and energy resources that apply to the LCSDI project.

5.17.3 Impacts and Mitigation Measures

5.17.3.1 Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to mineral and energy resources, but generally considers that implementation of the proposed project would have a significant impact if it were to:

- Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state;

- Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan; or

- Encourage activities which result in the use of large amounts of fuel, water, or energy, or use these in a wasteful manner.

Due to the nature of the proposed project, there would be no impacts related to the following significance criteria; therefore, no impact discussion is provided for these topics for the reasons described below:

Result in the Loss of Availability of a Mineral Resource of Value to the Region or State. The proposed project is not located within a significant mineral, oil, or gas resource producing area. The project proposes improvements to existing water supply infrastructure facilities and would not result in the loss of known mineral resources or make them inaccessible. Furthermore, public engineering projects are excluded from SMARA regulation. Therefore, this significance criterion would not be applicable to the proposed project.

Result in the Loss of Availability of a Locally Important Mineral Resource Recovery Site. The proposed project is not located within a significant mineral, oil, or gas resource area. The proposed project would improve existing water supply infrastructure facilities and would not result in the loss of a locally important mineral resource recovery site. Furthermore, public engineering projects are excluded from SMARA regulation. Therefore, this significance criterion is not applicable.

Use Large Amounts of Fuel, Water, or Energy, or Use such Resources in a Wasteful Manner (Operational Impacts). Operation of the proposed project would be similar to existing conditions and would not result in any substantial changes related to the use of fuel, water, or energy. Thus, operational impacts related to the use of large amounts of fuel, water, or energy are not applicable.

5.17.3.2 Approach to Analysis

As described above, the proposed project would not affect mineral resources or result in impacts related to the use of large amounts of fuel, water, or energy, nor would it use these resources in a wasteful manner during project operation. Thus, this impact analysis focuses on the potential for the proposed project to result in a substantial increase in energy demand and/or the wasteful use of energy during project construction. This analysis discusses how construction activities would be conducted to minimize the use of fuels and ensure that they are not used in a wasteful manner.

5.17.3.3 Impact Summary

Table 5.17-1 summarizes the potential mineral and energy resource impacts associated with implementation of the LCSDI project.

TABLE 5.17-1
SUMMARY OF IMPACTS – MINERAL AND ENERGY RESOURCES

	Significance Determination	
Impact	**LCSD Site**	**Sampling Station Site**
Impact ME-1: Construction-related energy use.	LS	LS
Impact C-ME: Cumulative impacts on energy use.	LS	LS

B = Beneficial impact
N/A = Not Applicable or no impact
LS = Less than Significant impact, no mitigation required
SM = Significant impact, can be Mitigated to less than significant
PSM = Potentially Significant impact, can be Mitigated to less than significant
SU = Significant Unavoidable impact
PSU = Potentially Significant Unavoidable impact

5.17.3.4 Impacts

Impact ME-1: Construction-related energy use.

Construction of the proposed project at both the Lower Crystal Springs Dam (LCSD) and Sampling Station #5 site would require the use of fuels (primarily gas, diesel, and motor oil) for construction activities, including excavation, grading, demolition, and vehicle travel during the 14-month construction period at LCSD site and 4-month period at the sampling station site. Gasoline, diesel, and motor oil consumption would be reduced through the implementation of greenhouse gas reduction measures, as described in Chapter 3, Section 3.6.8, SFPUC Standard Construction Measures and Greenhouse Gas Reduction Measures. These measures include maintaining vehicle tire pressure and implementing construction worker awareness education. The exhaust control measures to reduce excessive idling, as specified in Section 5.8, Air Quality, of this EIR, would also have a secondary effect of reducing the potential for inefficient energy use. In addition, construction contractors have an economic incentive to not use fuels inefficiently. Therefore, impacts associated with the proposed use of fuel and energy during project construction would be *less than significant*, and no mitigation is required.

As discussed in Section 5.17.3.1, Significance Criteria, the proposed operations would not result in substantial changes in energy or fuel consumption compared to existing conditions.

5.17.3.5 Mitigation Measures

None required.

5.17.3.6 Cumulative Impacts and Mitigation Measures

Impact C-ME: Cumulative impacts on energy resources.

The geographic scope of potential cumulative impacts related to energy resources encompasses the project site and the broader region, including the Peninsula watershed and adjacent areas.

Construction activities associated with the proposed project and cumulative projects described in Chapter 5, Table 5.1-1, would require the use of fuels and electricity to operate equipment and transport employees and materials, resulting in a significant cumulative increase in the use of energy resources. However, the proposed project would be subject to the California Air Resources Board's idling limits, thereby limiting the potential for the wasteful or inefficient use of fuels. Implementation of the SFPUC's Greenhouse Gas Reduction Actions (see Chapter 3, Section 3.6.8, SFPUC Standard Construction Measures and Greenhouse Gas Reduction Measures) and exhaust control measures specified in Section 5.8, Air Quality, which involve limiting idling time and performing low-emissions tune-ups, would ensure that fuels are not used wastefully or inefficiently. Therefore, the proposed project's contribution to the cumulative increase in construction-related energy consumption would not be cumulatively considerable (*less than significant*).

Operational activities associated with the cumulative projects would generally require the use of fuels and electricity to operate vehicles, run facilities, and supply homes. Operation of the identified cumulative SFPUC projects would include several non-energy-intensive improvements to the water system, such as pipelines, tunnels, and other gravity-driven water transmission facilities. The residential development projects would contribute to increases in energy consumption in San Mateo County; however, these projects would be required to meet California's Title 24 energy efficiency standards, which would ensure that energy is not used in a wasteful or excessive manner. Therefore, operation of the cumulative projects would not result in a cumulative impact related to wasteful or excessive use of energy resources. Regardless, the long-term operation of the LCSDI project would not result in changes in energy use from existing conditions, and the project would not contribute to cumulative increases in energy use.

5.17.4 References

California Division of Mines and Geology (CDMG), Mineral Land Classification: Aggregate Materials in the San Francisco-Monterey Bay Area, Special Report 145, Part II, 1987.

California Energy Commission (CEC), *Integrated Energy Policy Report*, December 2009, available online at http://www.energy.ca.gov/2009_energypolicy/index.html.

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San Francisco Public Utilities Commission (SFPUC), *Long Term Strategic Plan for Capital Improvements*, May 2002.

San Francisco Public Utilities Commission (SFPUC), Power Enterprise Billing Data (Actual Consumption, May 2007 – April 2008), 2008.

San Mateo County, General Plan Background and Issues, Chapter 3, Mineral Resources, 1986.

5.18 Agricultural Resources

This section analyzes the potential impacts on agricultural resources that could occur during construction and operation of the proposed Lower Crystal Springs Dam Improvements (LCSDI) project and assesses the potential for project implementation to adversely affect such resources.

5.18.1 Setting

5.18.1.1 Agricultural Resources

The proposed project is located entirely within the SFPUC Peninsula watershed lands in unincorporated San Mateo County. The SFPUC Peninsula watershed encompasses 23,000 acres of open space lands used primarily for water collection, transmission, and storage, and, with the exception of SFPUC water supply facilities including groundskeepers' cottages and ancillary structures, the Peninsula watershed is largely undeveloped. There are no existing agricultural resources in the LCSDI project area.

The California Department of Conservation, Division of Land Resource Protection, maps important farmlands throughout California. Important farmlands include prime farmland, farmland of statewide importance, unique farmland, farmland of local importance, and grazing land. In San Mateo County, the mapped areas of important farmland are concentrated along the Pacific coast and coastal valleys, and there are no important farmlands mapped in the project area (California Department of Conservation, 2008).

5.18.2 Regulatory Framework

5.18.2.1 Federal Regulations

The Farmland Protection and Policy Act requires an evaluation of the relative value of farmland that could be affected by decisions sponsored in whole or part by the federal government. The Farmland Protection and Policy Act would not apply to the proposed project, since it is not a federal government action or program.

5.18.2.2 State Regulations

The California Land Conservation Act of 1965, commonly referred to as the Williamson Act, provides financial incentives, through reduced property taxes, to deter the conversion of farmland and open space preserves to other land uses. The act enables local governments to enter into contracts with private landowners to ensure that specific parcels are kept in agricultural or open space use as "agricultural preserves."

There are no existing agricultural resources in the LCSDI project area under a Williamson Act contract, and this state regulation would not be applicable.

5.18.2.3 Local Regulations

There are no local regulations governing agricultural resources that are applicable to the LCSDI project.

5.18.3 Impacts and Mitigation Measures

5.18.3.1 Significance Criteria

The City and County of San Francisco (CCSF) has not formally adopted significance standards for impacts related to agricultural resources, but generally considers that implementation of the proposed project would have a significant impact if it were to:

- Convert prime farmland, unique farmland, or farmland of statewide importance, as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use;
- Conflict with existing zoning for agricultural use, or a Williamson Act contract; or
- Involve other changes in the existing environment which, due to their location or nature, could result in the conversion of farmland to non-agricultural use.

Due to the nature of the proposed project, there would be no impacts related to the following criteria; therefore, no impact discussion is provided for these topics for the reasons described below:

> *Conflict with Zoning for Agricultural Use or with a Williamson Act Contract*. The proposed project would not be located on land used for agricultural activities. Furthermore, the project site is not zoned for agricultural use, nor is it subject to a Williamson Act contract. Therefore, this significance criterion is not applicable to the proposed project.
>
> *Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to Non-agricultural Use*. The proposed project would not be located on land designated as prime farmland, unique farmland, or farmland of statewide importance. Therefore, this significance criterion is not applicable to the proposed project.
>
> *Involve Other Changes that Could Result in the Conversion of Farmland to Non-agricultural Use*. The proposed project would not be located on land used for agricultural activities. The proposed project would improve and modify existing infrastructure and would not involve changes that would result in the conversion of farmland to non-agricultural use. Therefore, this significance criterion is not applicable to the proposed project.

5.18.3.2 Impacts

As described above, implementation of the proposed project would not result in impacts related to agricultural resources. Therefore, there are no impacts under this topic.

5.18.3.3 Mitigation Measures

None required.

5.18.3.4 Cumulative Impacts

Implementation of the proposed project would not result in any cumulative impacts related to agricultural resources because the project would not result in any project-specific impacts related to this topic.

5.18.4 References

California Department of Conservation, Division of Land Resource Protection, *San Mateo County Important Farmland 2006*, published February 2008.

CHAPTER 6

Mitigation Measures

Sections

6.1 Plans and Policies
6.2 Land Use
6.3 Aesthetics
6.4 Population and Housing
6.5 Cultural and Paleontological Resources
6.6 Transportation and Circulation
6.7 Noise and Vibration
6.8 Air Quality
6.9 Wind and Shadow
6.10 Recreation
6.11 Utilities and Service Systems
6.12 Public Services
6.13 Biological Resources
6.14 Geology and Soils
6.15 Hydrology and Water Quality
6.16 Hazards and Hazardous Materials
6.17 Mineral and Energy Resources
6.18 Agricultural Resources
6.19 Supplemental Mitigation Measures

This chapter presents the mitigation measures for the environmental impacts identified as significant or potentially significant in the environmental impact analysis in Chapter 5, Environmental Setting, Impacts, and Mitigation Measures. This section also contains the cumulative mitigation measure listed in Chapter 5, Environmental Setting, Impacts, and Mitigation Measures, for cumulative impacts.

6.1 Plans and Policies

The analysis in Chapter 4, Plans and Policies, indicates that with mitigation measures identified in Chapter 5 of this EIR (presented in Section 6.2 et seq., below) the project as a whole would be consistent with applicable plans and policies, with the exception of San Francisco Priority Policy 7. Inconsistency with this policy, due to the project's significant and unavoidable impacts on Lower Crystal Springs Dam as a historic resource and significant and unavoidable cumulative impacts on historic resources, would be mitigated to the extent feasible by Mitigation Measures M-CP-1a and M-CP-1b (see Section 6.5, below).

6.2 Land Use

Neighborhood Notice

Measure LU-1a: The SFPUC or its contractor shall provide 14-day advance notice by mail to all facilities, tenants, and property owners within the Peninsula watershed and within 1,500 feet of project construction zones. The notice will also be posted near the project sites and at nearby recreational facilities. The notice shall state the construction location, nature of activities, and schedule. The notice shall indicate alternative traffic and bicycle routes and provide suggestions for avoiding traffic delays and reducing the effects of construction-related noise as well as dust and exhaust emissions (e.g., planning alternative schedules, closing windows facing the planned construction sites).

The SFPUC shall identify and provide a public liaison officer before and during construction to respond to the concerns of nearby residences, recreationists, and other potentially affected land uses. Procedures for contacting the public liaison officer via a toll-free telephone number, email, or in person shall be included in the notices. Prior to construction, the SFPUC communications manager, resident engineer, and construction manager shall develop procedures for receiving and responding to questions and complaints. This effort shall be coordinated with Mitigation Measures M-AE-2 (Site-Specific Construction Lighting Plan and Complaint Line) and M-NO-1 (Administrative and Source Controls), which also requires that the SFPUC develop procedures for receiving and responding to questions and complaints from the public.

Event Scheduling at the Pulgas Water Temple

Measure M-LU-1b: The SFPUC shall post signage at the Pulgas Water Temple in advance of construction to notify visitors of the nature, extent, and duration of construction activities. In addition, to ensure that weddings and other special events at the Pulgas Water Temple will not be adversely affected by construction activities, the SFPUC shall restrict special events at the Pulgas Water Temple during the construction period.

6.3 Aesthetics

Landscaping Plans

Measure M-AE-1: The SFPUC shall prepare and implement landscaping plans to restore project sites to their preconstruction condition such that short-term construction disturbance does not result in long-term visual impacts. To retain the existing visual character of the site and surrounding area, disturbed areas shall be recontoured, revegetated, and repaved to restore preconstruction conditions. Note that some areas consist of bare ground and would not require significant restoration once construction is complete. Landscape restoration shall include pruning of remaining vegetation for maximum vigor and opening of new "view windows" to frame views of the reservoir, dam, and bridge. Landscape plantings shall include non-invasive and, where possible, native grasses, shrubs, and trees similar to those in the existing landscape. The SFPUC shall monitor landscape plantings annually for five years after project completion to ensure that sufficient ground coverage has developed and shall implement additional measures, such as replanting or installing temporary irrigation systems, as determined necessary.

Site-Specific Construction Lighting Plan and Complaint Line

Measure M-AE-2: The SFPUC shall require the contractor to develop and implement a site-specific nighttime lighting plan. A qualified lighting professional shall prepare the plan, which shall specify lighting sources for nighttime operations and require that lighting be shielded and directed specifically onto work areas to minimize light spillover. The plan shall also provide for light source monitoring to ensure that feasible adjustments are made as necessary to provide maximum shielding during all phases of construction. The contractor shall submit the plan to the SFPUC for review and approval prior to commencing nighttime construction operations, at which time the plan shall be implemented continuously until the end of nighttime construction. In addition, the SFPUC shall provide a toll-free number in the SFPUC neighborhood notice (as required per SFPUC's Standard Construction Measures) for the public to report problems regarding lighting and other construction-related complaints. The SFPUC shall take corrective action in response to complaints regarding misdirected lighting within three business days of the complaint.

Tree Removal Plan

Measure M-AE-4: Prior to the removal of any trees along the Crystal Springs Reservoir shoreline, the SFPUC shall prepare a Tree Removal Plan to mitigate the long-term effects (10 years minimum) of inundation on shoreline woodlands. The purpose of the Tree Removal Plan is to identify a systematic approach that identifies the best means of removing dead trees resulting from inundation without causing harm to the watershed's biological diversity and water quality and that limits the removal activities to one-time per year. The Tree Removal Plan will be prepared by a qualified team of foresters, biologists, planners with visual resource expertise, and water quality resource experts. Following full implementation of the proposed increase in maximum normal operating levels in both Upper and Lower Crystal Springs Reservoirs, the SFPUC shall implement the Tree Removal Plan as necessary, depending on the specific operational changes in reservoir water levels (i.e., as related to meteorological and hydrological conditions, customer demand, maintenance, outages, exceedances, etc.).

In developing this plan, the SFPUC shall consider the following criteria to determine the feasibility of removing trees along the shoreline:

- Trees must be dead or dying before they are removed.
- Trees are highly visible from key public viewpoints and other publicly accessible places.
- Trees are readily accessible either by an existing watershed access road, by boat, or helicopter.
- Any potential adverse impacts to water quality would be eliminated with implementation of Best Management Practices, particularly at stream crossings and for erosion control.

- No new roads would be constructed for the purposes of tree removal.
- Tree removal would not result in substantial adverse impacts to special-status biological resources and/or sensitive habitats such as wetlands, aquatic, and oak woodlands.

Elements of the Tree Removal Plan

GIS maps of vegetation types overlaid with Crystal Springs Reservoir level contours (see Figure 5.3-12) and special status species locations will help SFPUC to identify potential tree removal areas that are readily noticeable from public viewpoints along scenic resources (e.g., Sawyer Camp Trail, Skyline Boulevard, Highway 92, and Cañada Road). Trees which are not highly visible from public locations within the watershed, or are only visible from less-utilized remote viewpoints, do not need to be removed. (Some areas not visible to the public include upper San Mateo Creek and the far west side of Upper Crystal Springs Reservoir.) The Tree Removal Plan shall consider the above-listed criteria and shall also consider the overall site conditions, slope stability, and potential effects related to biological and water resources, traffic, and nearby recreational uses to weigh the feasibility, the visual benefits and potential effects of tree removal.

The Tree Removal Plan shall include the following elements:

- *GIS maps of vegetation types overlaid with Crystal Springs Reservoir level contours*. SFPUC shall use mapped GIS data to coordinate potential tree removal areas with locations of known protected biological species and water courses and to determine applicability of additional biological and water quality protection measures (described below).
- *Methodology*. SFPUC shall provide a description as to how the tree removal site would be accessed (i.e., via boat, existing access road, or helicopter). The means selected for access to the affected trees shall comply with all applicable biological mitigation procedures (which are summarized below) such that tree removal activities do not cause damage to protected biological resources or water quality.

  This section of the plan shall also describe methods of tree removal. SFPUC shall cut down flush to grade and remove selected mature trees (defined as trees greater than 4 inches in diameter at breast height) from designated shoreline oak woodlands, mixed evergreen forests, and non-native woodlands that die from inundation as a result of post-project reservoir operations.
- *Protection/avoidance measures*. Particular consideration shall be given to avoiding sensitive species, protecting water quality, and preventing erosion, particularly at stream crossings. A qualified biologist shall make a site-specific determination of the sufficiency of the biological mitigation measures described below to prevent significant adverse impacts to special-status biological resources. If mitigation measures would not prevent such impacts or tree removal is not feasible due to site-specific access conditions, then the SFPUC shall not remove the dead trees. The following mitigation measures identified in Section 5.13, Biological Resources, shall be implemented to minimize impacts to sensitive biological resources near selected tree removal sites:
  - Mitigation Measure M-BI-1a, Worker Training Program
  - Mitigation Measure M-BI-1b, Avoidance and Restoration

  - Mitigation Measure M-BI-2, Individual Tree Replacement
  - Mitigation Measure M-BI-3c, Biological Monitoring
  - Mitigation Measure M-BI-3d, Preconstruction Surveys and Avoidance of Nesting Birds
  - Mitigation Measure M-BI-3g, General Avoidance Measures

  To avoid adverse effects on water quality, applicable best management practices (BMPs) from Mitigation Measure M-HY-3 (Preparation and Implementation of a SWPPP) shall also be included. In particular, erosion and sedimentation BMPs and the reservoir protection BMP shall be included in the Tree Removal Plan. See Section 5.15, Hydrology and Water Quality, for details.

- *Sudden Oak Death protocols*. The Tree Removal Plan shall be consistent with San Mateo County's Sudden Oak Death (SOD) protocols. The San Mateo County agricultural commissioner is the local enforcement agent for state and federal SOD regulations. To prevent the spread of this disease to uninfected areas, San Mateo County's agricultural commissioner regulates the movement of wood and plant materials consistent with state and federal regulations.

  Unless a compliance agreement is obtained from the County's agricultural commissioner, San Mateo County prohibits the transportation of SOD-infected material (i.e., bark chips, mulch, or proven SOD hosts located or grown in San Mateo County) outside the quarantined area. This area includes San Mateo County and most Bay Area counties as SOD has spread throughout much of the Bay Area. However, since there are still areas within San Mateo County that have not been exposed to SOD, the Agriculture Commissioner prefers that all SOD-infected material be chipped and left onsite (Eide, 2009). If chipped material cannot be left onsite, SFPUC shall abide by basic SOD protocols, including:

  - Chipping of wood should take place as close as possible to the harvested areas until chipped material is enclosed in a sealed container (if transporting away from harvested area)(Baker, 2009);
  - Shipping of wood materials possibly carrying the SOD pathogen (chipped or not) shall be enclosed in a sealed container pursuant to California Code of Regulations Section 3700, 7 CFR 301.92, and subject to county transportation restrictions (Baker, 2009);
  - Any SOD-infected material that requires movement outside a quarantined area is subject to a compliance agreement with San Mateo County's agricultural commissioner (Eide, 2009).

- *CAL FIRE timber removal procedures*. The Tree Removal Plan shall also generally conform to accepted timber operations practices such as those governed by the Forest Practice Rules currently regulated by the California Department of Forestry and Fire Protection (CAL FIRE). Commercial revenue will not be generated from the removal of dead trees from along the shoreline, and therefore the CAL FIRE Forest Practice Rules (and elements of the Timber Harvest Planning protocol) shall be advisory only and shall not limit the removal of dead trees from otherwise sensitive locations such as steep slopes and riparian areas next to the shoreline. Conformance to biological mitigation and/or water quality protection measures could, however, limit or prevent removal of dead trees in these most sensitive areas.

- *SFPUC Watershed Maintenance Activities.* Whenever possible, the Tree Removal Plan shall integrate applicable SFPUC watershed maintenance activities to support long-term management objectives of the tree removal areas.

Implementation: Visual Site Analysis and Annual Tree Removal

- After the Tree Removal Plan has been completed and the effects of reservoir inundation become apparent, the SFPUC shall visually assess the health of the trees around the perimeter of the reservoir. Each year, annually for the following ten years, SFPUC shall determine if any dead or dying trees, that are visible from public viewpoints require removal as a result of inundation. It is estimated that approximately two thirds of all the trees that may die from inundation (about 27 acres over the ten year period) would be visible and shall need to be removed where feasible. Each year the SFPUC shall identify which dying trees are subject to removal and remove them in accordance with the guidelines established in the Tree Removal Plan.

6.4 Population and Housing

No mitigation measures are required for project-specific effects on growth inducement and housing. (Please refer to Chapter 7 and Appendix E of the WSIP PEIR, which are incorporated into this EIR by reference, for discussion of mitigation measures for growth inducement and indirect impacts of growth associated with the WSIP.)

6.5 Cultural and Paleontological Resources

HAER Recordation and Public Interpretation

Measure M-CP-1a: The SFPUC shall hire a qualified cultural resources specialist to document the LCSD with a historical narrative and large format photographs in a manner consistent with the Historic American Engineering Record (HAER). Copies of the narrative and photographs shall be distributed to the San Francisco Public Library (Main Branch), branches of the San Mateo County Library system, as well as the San Mateo County Historical Association and San Mateo County History Museum, the History and Heritage Committee for Engineers, the Millbrae Historical Society, the Hillsborough Historical Society, and the Burlingame Historical Society. The preparation of the HAER document shall follow standard National Park Service procedures (NPS, 1990).

There will be three main tasks: gather data, prepare photographic documentation, and prepare a written historical and descriptive report. Photographic documentation shall include 4- by 5-inch negatives in labeled sleeves, 8- by 10-inch prints mounted on labeled photo cards, and an index to the photographs. Photographs shall be taken of the LCSD's character-defining features, including but not limited to the parapet wall, spillway, stilling basin, and abutments, as well as the historical setting of the dam. The research shall include possible photographic reproduction of any valuable engineering blueprints. The SFPUC shall coordinate and consolidate HAER recordation of the LCSD with recordation of its associated Outlet Structure 1 (OS-1), the latter of which is a mitigation measure identified in the CSSA Transmission Upgrade EIR.

The SFPUC shall also develop interpretive panels for the LCSD. The panels shall include a history of the resource and some drawings or photographs depicting the unique design and history of the dam. As appropriate, information about the relationship between the dam and OS-1 shall be included. The panels shall be displayed at publicly accessible areas adjacent to the dam. The objective of the interpretive panels is to increase local and regional public awareness of this resource as well as awareness of the SFPUC's efforts to educate citizens about the history of the regional water system.

Much of the information gathered for the HAER recordation effort, described above, can be reused in the interpretive panels.

Historic Resources Protection Plan

Measure M-CP-1b: The SFPUC shall hire a qualified historian to prepare a historic resources protection plan that specifies procedures for protecting the LCSD during construction and a monitoring method to be employed by the contractor working near the LCSD. At a minimum, the plan will address the operation of construction equipment adjacent to the dam, storage of construction materials away from the dam, and education/training of construction workers about the dam's historical significance. The SFPUC shall implement the plan throughout construction at the dam site. The purpose of this measure is to protect other portions of the dam from accidental damage during construction that would not already be affected by the proposed project. This measure is considered an additional layer of protection for the historic dam, which is listed in the NRHP, and should be afforded as much protection from accidental damage during construction as possible.

Procedures Addressing Inadvertent Discovery of Archaeological Resources

Measure M-CP-3: To avoid any potential adverse project effects from the accidental discovery of buried or submerged historic resources, as defined in CEQA Guidelines Section 15064.5(a)(c), the SFPUC shall distribute the Planning Department's archaeological resource "ALERT"[1] sheet to the project's prime contractor; any project subcontractor firms (including demolition, excavation, grading, foundation, pile driving, etc.); and/or utilities firm involved in soil-disturbing activities within the project site. Prior to any soil-disturbing activities, each contractor shall be responsible for ensuring that the ALERT sheet is circulated to all field personnel, including machine operators, field crew, pile drivers, supervisory personnel, etc. The SFPUC shall provide the Environmental Review Officer (ERO) with a signed affidavit from the responsible parties (prime contractor, subcontractor(s), and utilities firm) confirming that all field personnel have received copies of the ALERT sheet.

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[1] The ALERT sheet states that in the event of discovery of the following cultural materials, all work must be stopped in the area and the Environmental Review Officer contacted to evaluate the find: concentrations of shellfish remains; evidence of fire (ashes, charcoal, burnt earth, fire-cracked rocks); concentrations of bones; recognizable Native American artifacts (arrowheads, shell beads, stone mortars [bowls], humanly shaped rock); building foundation remains; trash pits, privies (outhouse holes); floor remains; wells; concentrations of bottles, broken dishes, shoes, buttons, cut animal bones, hardware, household items, barrels, etc.; thick layers of burned building debris (charcoal, nails, fused glass, burned plaster, burned dishes, etc.); wood structural remains (building, ship, wharf, etc.); clay roof/floor tiles; stone walls or footings; or gravestones.

If the ERO determines that an archaeological resource may be present within the project site, the SFPUC shall retain the services of a qualified archaeological consultant. The archaeological consultant shall advise the ERO as to whether the discovery is an archaeological resource that retains sufficient integrity and is of potential scientific/historical/cultural significance. If an archaeological resource is present, the archaeological consultant shall identify and evaluate the archaeological resource. The archaeological consultant shall make a recommendation as to what action, if any, is warranted. Based on this information, the ERO may require, if warranted, specific additional measures to be implemented by the SFPUC. These measures might include: preservation in-situ of the archaeological resource; an archaeological monitoring program; or an archaeological evaluation program. If an archaeological monitoring program or archaeological testing program is required, it shall be consistent with the WSIP Archaeological Guidance (MEA, 2008) for such programs. The ERO may also require that the project sponsor immediately implement a site security program if the archaeological resource is at risk from vandalism, looting, or other damaging actions.

The project archaeological consultant shall submit an accidental discovery archaeological data recovery report (ADRR) to the ERO which, in addition to the usual contents of the ADRR, shall include: (1) an evaluation of the historical significance of any discovered archaeological resource; (2) a description of the archaeological and historical research methods employed in the archaeological monitoring/data recovery program(s) undertaken; and (3) a presentation, analysis, and interpretation of the recovered data. Information that may put at risk any archaeological resource shall be provided in a separate removable insert within the final report.

Once approved by the ERO, copies of the ADRR shall be distributed as follows: the relevant California Historical Resources Information System Information Center shall receive one copy, and the ERO shall receive a copy of the transmittal letter of the ADRR to the Information Center. The San Francisco Planning Department, Major Environmental Analysis Division shall receive three copies of the ADRR along with copies of any formal site recordation forms (California Department of Parks and Recreation Form 523 series) and/or documentation for nomination to the NRHP/CRHR. The SFPUC shall receive copies of the ADRR in the number requested. In instances of high public interest in or the high interpretive value of the resource, the ERO may require a different final report content, format, and distribution than that presented above.

Procedures Addressing Unanticipated Discovery of a Paleontological Resource

Measure M-CP-4: If a paleontological resource (fossilized invertebrate, vertebrate, plant, or microfossil) is found during project construction, excavations within 50 feet of the find shall be temporarily halted or diverted, and the ERO shall be contacted to determine how to evaluate the find in the most expeditious manner possible. Typically, the ERO would recommend that a qualified paleontologist be called to the site to document the discovery and evaluate whether the fossil is significant and worthy of salvage. If the fossil is determined to be significant and avoidance is not feasible, the paleontologist, in consultation with the SFPUC and the ERO, shall develop and implement an excavation and salvage plan in accordance with Society of Vertebrate Paleontology standards (SVP, 1995; SVP, 1996).

Procedures Addressing Inadvertent Discovery of Human Remains

Measure M-CP-5: The treatment of human remains and associated or unassociated funerary objects discovered during any soil-disturbing activity shall comply with applicable state law. State law requires immediate notification of the coroner of the county within which the project is located and, in the event of the coroner's determination that the human remains are Native American, notification of the NAHC, which would appoint a Most Likely Descendent (MLD) (PRC Section 5097.98). The MLD would make all reasonable efforts to develop an agreement for the treatment, with appropriate dignity, of human remains and associated or unassociated funerary objects (CEQA Guidelines Section 15064.5[d]). The agreement shall take into consideration the appropriate excavation, removal, recordation, analysis, custodianship, curation, and final disposition of the human remains and associated or unassociated funerary objects. The PRC allows 48 hours to reach agreement on these matters. If the MLD and the other parties do not agree on the reburial method, the landowner shall follow PRC Section 5097.98(b), which states that "the landowner or his or her authorized representative shall reinter the human remains and items associated with Native American burials with appropriate dignity on the property in a location not subject to further subsurface disturbance."

Conduct a Geotechnical Study to Evaluate the Condition of the Retaining Wall, and if Necessary, Relocate and Extend the South Crystal Springs Cottage Retaining Wall

Measure M-CP-6: The SFPUC shall conduct a geotechnical study to evaluate the structural condition of the existing masonry retaining wall along the western edge of the South Crystal Springs Cottage property. If the study determines that the wall cannot withstand the infrequent and short-term water-level exceedances up to 291.8 feet during large storms over the watershed, the wall shall be relocated a few feet back from the new shoreline edge and extended along the entire terraced edge of the cottage property to prevent soil erosion due to wave action. This effort would eliminate any potential future direct effects on the cottage due to rising water levels in the reservoir. If the study determines that the retaining wall can withstand the infrequent and short-term exceedances of 291.8 feet during large storms over the watershed, no improvements to the wall would be necessary.

6.6 Transportation and Circulation

Traffic Control Plan

Measure M-TR-1: The SFPUC shall ensure that the contractor prepares and successfully implements a traffic control plan. The traffic control plan shall include appropriate project-specific measures, including measures to reduce potential impacts related to traffic flows on roadways affected by project construction activities. The SFPUC and construction contractor(s) shall also coordinate with local jurisdictions and Caltrans, as appropriate, for affected roadways and intersections. The traffic control plan shall include, but not necessarily be limited to, the elements listed below. In no case, however, will the traffic control plan contain elements that are inconsistent with traffic safety recommendations by agencies with jurisdiction over roadways in the project area (e.g., San Mateo County or Caltrans).

- The SFPUC shall coordinate with San Mateo County on traffic and bicycle detours developed as part of the Crystal Springs Dam Bridge Replacement project to ensure that throughout construction of the LCSDI project, the detours remain accessible for motorists and bicyclists and that adequate signage and notification of the detours are maintained.

- The SFPUC shall notify all emergency service providers in advance of construction to inform them of the construction activities, road closures, and detours.

- Circulation and detour plans shall minimize impacts on local street circulation. Haul routes that minimize truck traffic on local roadways and residential streets shall be utilized to the extent feasible. As necessary, flaggers and/or signage shall be used to guide vehicles at project access points.

- Haul trucks shall be restricted from using Bunker Hill Drive between the I-280 ramps and Polhemus Road to avoid potential conflicts with bicyclists, except in the event that other access to Skyline Boulevard and the LCSD is not available.

- The construction contractor shall be responsible for keeping the pavement clean from debris, spills, etc. from haul trucks on Skyline Boulevard and Crystal Springs Road in the vicinity of the LCSD site access road. At a minimum, Skyline Boulevard and Crystal Springs Road shall be swept clean twice a week (e.g., at a minimum, the roads shall be swept at the end of the workday on Friday to maintain clean pavement for Saturday morning bicyclists).

- A public information program shall be developed and implemented to advise motorists, bicyclists, nearby residents, and adjacent commercial establishments of the impending construction activities (e.g., media coverage, direct distribution of flyers to affected properties, email notices, portable message signs, and informational signs at the job sites).

- Detour signs shall be posted for bicycles and pedestrians in the vicinity of the Skyline Boulevard roadway closure to notify bicyclists and pedestrians of alternative routes.

- Signage shall be posted at the LCSD vista point and southern Sawyer Camp Trail trailhead to notify recreationists of alternative parking areas that would remain available during project construction activities.

- When feasible, truck trips on Crystal Springs Road and Polhemus Road shall be avoided during the school drop-off and pickup hours for the Odyssey School. When infeasible, additional flaggers shall be provided during school drop-off and pickup hours near the intersection of Crystal Springs Road and Polhemus Road to manage traffic flow and maintain traffic safety. The construction contractor shall confirm the start and dismissal times prior to the beginning of each school year.

- All equipment and materials shall be stored in designated contractor staging areas.

- Locations shall be identified for construction worker parking within the construction zone or, if necessary, at a nearby location where transport would be provided between the parking location and the worksite. Construction workers shall not be permitted to park along Crystal Springs Road or Skyline Boulevard within the vicinity of the Sawyer Camp Trail trailhead.

- In conjunction with San Mateo County, the SFPUC shall provide advanced information to emergency service providers regarding the closure of Skyline Boulevard and shall notify emergency service providers of traffic and bicycle detour routes prior to the start of construction. The SFPUC shall provide regular updates on planned construction activities and schedule. If necessary, the SFPUC shall provide access to emergency service providers to the closed portions of Skyline Boulevard from both the north and south ends of the project construction area.

- Roadside safety protocols shall be implemented such as "Road Work Ahead" warning signs and speed controls to achieve required speed reductions for safe traffic flow through the work zone.

- Roadway rights-of-way shall be repaired or restored to their preconstruction conditions upon the completion of construction.

- To the extent applicable, the traffic control plan shall conform to the *California Manual on Uniform Traffic Control Devices for Streets and Highways: Part 6 Temporary Traffic Control* (Caltrans, 2006).

Coordinated Peninsula Regional Transportation Management Plan

Measure M-C-TR: The SFPUC and its regional construction management contractor shall work with San Mateo County to prepare and implement a transportation management plan for Skyline Boulevard/Crystal Springs Road and to address the transportation impact of the five overlapping construction projects within the vicinity of the LCSD in the Peninsula watershed region. The transportation management plan shall include, but is not limited to, the following requirements:

- Coordination of individual traffic control plans for SFPUC projects and non-SFPUC projects.

- Coordination between the contractor and San Mateo County to develop circulation and detour plans that include safety features (e.g., signage and flaggers). The circulation and detour plans shall address:
  - Full and partial roadways closures
  - Circulation and detour plans to include the use of signage and flagging to guide vehicles through and/or around the construction zone, as well as any temporary traffic control devices
  - Bicycle detour plans
  - Parking for recreational uses along Skyline Boulevard
  - Haul routes for construction trucks and staging areas for instances when multiple trucks arrive at the worksite
  - Public information outreach program to notify nearby residents and recreational users of the Skyline Boulevard/Crystal Springs Road area of construction activities

Protocols for updating the transportation management plan to account for delays or changes in the schedules of individual projects.

6.7 Noise and Vibration

Administrative and Source Controls

Measure M-NO-1: The SFPUC shall include in construction contract specifications a requirement to prepare a noise control plan. The contractor shall submit a noise control plan, prepared by a qualified noise consultant, to the SFPUC for review and approval at least 21 days before the start of mobilization or construction. The SFPUC shall require the noise consultant to be a board-certified Institute of Noise Control Engineering member or other qualified consultant or engineer, to be approved by the SFPUC project construction manager. The noise control plan shall contain performance standards based on speech (70 dBA, Leq) and sleep (50 dBA, Leq) interference thresholds as appropriate, but these thresholds shall be adjusted to reflect existing ambient noise levels as necessary. At a minimum, the plan shall contain the following measures to maintain noise levels at or below these performance standards:

a. Best available noise control techniques (including mufflers, intake silencers, ducts, engine enclosures, and acoustically attenuating shields or shrouds) shall be used for all equipment and trucks as necessary in order to minimize construction noise impacts.

b. If impact equipment (e.g., concrete/rock breaker, rock drill) is used during project construction, hydraulically or electric-powered equipment shall be used wherever feasible to avoid the noise associated with compressed-air exhaust from pneumatically powered tools. However, where the use of pneumatically powered tools is unavoidable, an exhaust muffler on the compressed-air exhaust shall be used where necessary (a muffler can lower noise levels from the exhaust by up to about 10 dBA). External jackets on the tools themselves shall be used, where feasible, which could achieve a reduction of 5 dBA. Quieter procedures, such as drilling rather than impact equipment, shall be used whenever feasible.

c. Adequate muffling (with enclosures where feasible and appropriate) shall be used on all stationary equipment as necessary to ensure local noise ordinance limits are met to the extent feasible. Enclosure openings or vents shall face away from sensitive receptors to the east (at the toe of the dam) and north (at the top of the dam). If any stationary equipment (e.g., fans, generators, or pumps) is operated beyond the time limits specified by the San Mateo County and Hillsborough noise ordinances, this equipment shall conform to the 50-dBA sleep interference threshold, adjusted to reflect ambient noise levels.

d. Material stockpiles as well as maintenance/equipment staging and parking areas shall be located as far from the closest residential and recreational receptors as possible.

e. To minimize noise impacts associated with backup alarms: (1) smart or broadband alarms shall be utilized wherever feasible, if they have been approved by Cal-OSHA at the time of construction and the contractor determines such alarms would not present heightened safety risks; (2) haul and delivery routes, as well as stockpile locations, shall be configured in all staging areas where possible to minimize the use of backup alarms; and (3) operation of equipment requiring the use of backup beepers shall be avoided to the extent feasible during nighttime hours (10 p.m. to 7 a.m.).

f. A designated project liaison shall be responsible for responding to noise complaints during the construction phases. The name and phone number of the liaison shall be conspicuously posted at construction areas and on all advanced notifications. This person shall take steps to resolve complaints, including conducting periodic noise monitoring, if necessary. Results of noise monitoring shall be presented at regular project meetings with the project contractor, and the liaison shall coordinate with the contractor to modify any construction activities that generate excessive noise levels to the extent feasible.

g. In the event of noise complaints, the contractor shall provide information to the SFPUC within 48 hours of being notified of the complaint regarding the noise levels measured and activities that correspond to the complaints. The SFPUC shall compare the noise levels to the information provided in the noise control plan, and if necessary, the effectiveness of implemented noise control measures shall be verified by the contractor. The contractor shall be responsible for the correct installation and use of all implemented noise control measures and for complying with noise specifications.

Blasting Noise Controls

Measure M-NO-4: The noise control plan shall specify that initial blasting activities be monitored to determine if blasting-related peak noise events exceed the San Mateo County Noise Ordinance noise limit of 75 dBA (Lmax) at the closest residential receptors. If blasting noise levels are found to exceed this limit, blasting charges shall be modified to the extent feasible to be consistent with these noise limits, which would require blasting charges to be reduced so that noise levels do not exceed 101 dBA (Lmax) at 50 feet from the closest sensitive receptors. Alternatively, if blasting charges cannot be reduced sufficiently, then the frequency of blasting (i.e., the number of blast events during any given hour) shall be reduced to meet San Mateo County Noise Ordinance noise limits.

Coordinated Noise Control Plan

Mitigation Measure M-C-NO: The SFPUC or its contractors shall prepare a coordinated noise control plan that outlines noise controls in the Lower Crystal Springs Dam vicinity to ensure that the 70-dBA speech interference threshold is not exceeded during the daytime and evening hours (7 a.m. to 10 p.m.) and the 50-dBA sleep interference threshold is not exceeded during the nighttime hours (10 p.m. to 7 a.m.), to the maximum extent possible, when the combined noise effects from the following projects are considered: LCSDI, CSSA Transmission Upgrade, and CSPL2 Replacement (Sites 1 and 2).

6.8 Air Quality

Dust Control Measures

Measure M-AQ-1a: The SFPUC shall include these measures in contract specifications, where applicable:

- All active construction areas shall be watered at least twice daily.
- All trucks hauling soil, sand, and other loose debris shall be covered.

- All unpaved access roads, parking areas, and staging areas at construction sites shall either be paved, watered three times daily, or nontoxic soil stabilizers shall be applied.
- All visible mud or dirt track-out onto adjacent public roads shall be swept at least once per day with wet power vacuum sweepers.
- All vehicle speeds on unpaved roads shall be limited to 15 mph.

Exhaust Control Measures

Measure M-AQ-1b: To limit exhaust emissions associated with the project, the SFPUC shall implement the following exhaust controls, where applicable:

- Contract specifications shall include Sections 2480 and 2485, Title 13, California Code of Regulations, which limit the idling of all diesel-fueled commercial vehicles (weighing over 10,000 pounds, both California- or non-California-based trucks) to 30 seconds at a school or five minutes at any location. In addition, the use of diesel auxiliary power systems and main engines shall be limited to five minutes when within 100 feet of homes or schools while the driver is resting. Clear signage shall be provided for construction workers at all access points.
- Contract specifications shall include Section 93115, Title 17, California Code of Regulations, Airborne Toxic Control Measure for Stationary Compression Ignition Engines, which specifies fuel and fuel additive requirements; emission standards for operation of any stationary, diesel-fueled, compression-ignition engines; and operation restrictions within 500 feet of school grounds when school is in session.
- A schedule of low-emissions tune-ups shall be developed, and such tune-ups shall be performed on all equipment, particularly haul and delivery trucks. A log of required tune-ups shall be maintained, and a copy of the log shall be submitted to the SFPUC.
- Low-sulfur fuels shall be used in all stationary and mobile equipment.

Additional Exhaust Control Measures

Measure M-AQ-1c: If proposed BAAQMD CEQA Guidelines are adopted and in effect at the time of EIR certification, the SFPUC shall implement the following BAAQMD-specified exhaust controls in addition to those controls specified in Mitigation Measure M-AQ-1b to reduce exhaust emissions associated with the project:

- Limit idling time of diesel powered construction equipment to two minutes. (If proposed BAAQMD CEQA Guidelines are adopted and in effect at the time of EIR certification, this measure shall supersede the condition in Mitigation Measure M-AQ-1b which limits idling to five minutes at any location other than a school.)
- The SFPUC shall implement additional mitigation measures to reduce exhaust emissions of NO_x from construction activities. The SFPUC shall ensure that construction contract specifications include a requirement that on-road diesel trucks used to transport spoils consist of 2004 or newer model-year trucks with factory-built engines. All on-road diesel trucks will be required to have emission control labels as specified in 13 CCR 2183(c). The construction contract specifications will require that the contractor submit to the SFPUC a comprehensive inventory of all on-road trucks used to haul spoils. The

inventory will include each vehicle's license plate number, the engine production year, and a notation of whether the truck is in possession of an emission control label as defined in 13 CCR. The contractor shall update the inventory and submit it monthly to the SFPUC throughout the duration of the project.

- The SFPUC shall ensure that construction contract specifications include a requirement that all off-road terrestrial diesel construction equipment (with the possible exception of certain types of very specialized construction equipment for which controls are not commercially available), is equipped with Tier 2 or 3 diesel engines as defined in 13 CCR 2485 and are equipped with Level 3 Diesel Emission Control Strategies as defined in 13 CCR 2700–2710. The construction contract specifications will require the contractor to submit a comprehensive inventory of all off-road construction equipment that will be used an aggregate of 8 hours or more during any portion of project construction. The inventory will include each vehicle's license plate number, horsepower rating, engine production year, and projected hours of use or fuel throughput for each piece of equipment. The contractor shall update the inventory and submit it monthly to the SFPUC throughout the duration of the project.

6.9 Wind and Shadow

Because implementation of the proposed project would not result in impacts related to wind and shadow (see analysis in Section 5.9), no mitigation measures would be required.

6.10 Recreation

Notify Bicycle Organizations of Detours

Measure M-RE-1: Prior to construction, the SFPUC shall actively work with San Mateo County, C/CAG of San Mateo County, and other local agencies to identify bicycle organizations (such as the Western Wheelers Bike Club, Bay Area Bicycle Coalition, and the Silicon Valley Bike Coalition) and to notify them of the construction activities and bicycle detour routes. This shall include notifications to organizations sponsoring bicycle events or races in the Peninsula region. In addition to providing information along the bicycle detour routes, the SFPUC shall also provide information to bicyclists regarding alternative bicycle routes in the area, either through printed brochures and/or on websites.

Coordinate Trail Access for Sawyer Camp Trail during Construction

Measure M-C-RE: The SFPUC shall coordinate measures to reduce impacts associated with access to and parking for the Sawyer Camp Trail from the proposed project and the CSSA Transmission Upgrade project, and shall coordinate with San Mateo County for measures to reduce impacts from the proposed project and the Crystal Springs Dam Bridge Replacement project. The purpose of the coordination is to minimize the durations of trail closure, maximize trail access, and provide information to trail users about alternative locations and access. The SFPUC shall post notices of temporary trail closures and/or disruptions at the trailheads and on SFPUC's website during the construction of the LCSDI and CSSA Transmission Upgrade projects, and shall coordinate with San Mateo County for posting notices during construction of the Crystal Springs Dam Bridge Replacement projects. The SFPUC website shall include information for alternate locations and access to other comparable trails for recreationalists to use during temporary closures.

6.11 Utilities and Service Systems

Coordinate Final Construction Plans with Affected Utilities

Measure M-UT-1: The SFPUC or its contractors shall coordinate final construction plans and specifications with Caltrans, PG&E, the USGS, the CGS, and any utilities potentially affected by the project. For each potentially affected utility provider, a contractual agreement or permit, as applicable, shall be completed and signed by the SFPUC and the utility agency. The agreement or permit shall specify appropriate procedures for managing the utilities to avoid damage and disruption to service during project-related construction activities.

Waste Management Plan

Measure M-UT-4: The construction contractor(s) shall prepare a waste management plan identifying the types of debris that shall be generated by the project and the manner in which those waste streams shall be handled. In accordance with the priorities of State Assembly Bill 989, the plan shall emphasize source reduction measures followed by recycling and composting methods to reduce the amount of waste being disposed of in landfills. The plan shall specify that 100 percent of inert solids (such as asphalt, brick, concrete, dirt, fines, sand, soil, and stone) must be diverted from disposal, and that 50 percent of all other non-inert materials (wood, metal, cardboard, green waste, gypsum, fixtures, etc.) must be diverted from landfills. The plan shall be reviewed by the SFPUC, and, upon project completion, the contractor shall submit receipts to the SFPUC documenting that the stated waste reuse, recycling, and disposal goals have been met.

6.12 Public Services

Because implementation of the proposed project would not result in significant impacts related to public services (see analysis in Section 5.12), no mitigation measures would be required.

6.13 Biological Resources

Worker Training Program

Measure M-BI-1a: This measure is applicable to all construction impacts (Impacts BI-1 through BI-5). A worker awareness program (environmental education) shall be developed by a qualified biologist and implemented by a qualified biologist or environmental inspector to inform project workers of their responsibilities regarding sensitive resources that are present in the project area. The program shall comply with the following measures:

- The program shall be developed by a biologist familiar with the special-status biological resources that could occur in the project area. The training program shall be approved by a SFPUC staff biologist prior to implementation, if prepared by a consulting biologist.

- This program shall include training for all construction personnel before any work occurs in the project area, including equipment mobilization, vegetation clearing, or site grading. If new construction personnel are added to the project, the contractor shall ensure that new personnel receive training before they start working. The subsequent training of personnel can include a videotape of the initial training and/or the use of written materials rather than in-person training by a biologist.

- The training shall provide educational information on the natural history of the special-status species that could occur in the area, how to identify the species, as well as sensitive biological resources such as wetlands, riparian vegetation, and trees. The presentation shall review required mitigation measures (especially those included under Mitigation Measure M-BI-3g, General Avoidance Measures) to avoid impacts on the special-status resources, and penalties for noncompliance with biological mitigation requirements. The training shall also provide information regarding the importance of preventing the spread of non-native, invasive species.

Avoidance and Restoration

Measure M-BI-1b: Staging areas and other work areas shall be maintained in a weed-free condition (using herbicides, manual control, or other methods) to prevent the spread of non-native invasive plants on equipment and vehicles. Equipment and vehicles shall be washed or otherwise decontaminated before they are moved into construction sites from other locations to prevent the introduction of invasive species or pathogens.

Where it is not possible to avoid temporary loss of riparian habitat in construction areas, the SFPUC shall fully restore the functions and services of these habitats onsite, which will include revegetation of all graded surfaces with locally native plant species, and revegetation of channel banks disturbed by construction. Disturbed streambeds shall also be restored. Site restoration shall be undertaken in accordance with a detailed restoration plan or plans prepared by a qualified restoration ecologist and shall be consistent with all required permits, and all planting materials shall be pathogen-free. The final habitat restoration plan or plans shall provide, at a minimum:

> *Aquatic Habitat Restoration Goals and Objectives.* Fully restore all temporary impacts on wetland streams and riparian habitat within three years of the completion of construction.
>
> *Restoration Work Plan.* The final habitat restoration plan(s) shall include detailed written specifications and work descriptions for the restoration projects, including but not limited to: the geographic boundaries of the projects; construction methods; timing and sequence; methods for establishing the desired plant communities; plans to control invasive plant species; and erosion control measures.
>
> *Success Criteria.* The final habitat restoration plan(s) shall include ecologically based criteria that will be used to determine whether the restoration projects are achieving their objectives (i.e., full restoration within five years). The success criteria shall be based on attributes that are objective and verifiable, such as percent survival of plantings or percent cover achieved by planted materials.

> *Monitoring Plan.* The final habitat restoration plan(s) shall include a description of parameters to be monitored to determine whether the restoration projects are on track to meet performance standards and whether adaptive management is needed. A schedule for monitoring and reporting on monitoring results must be included.

Wetlands Creation and Enhancement for Construction and Operational Impacts

Measure M-BI-1c: The SFPUC shall compensate for unavoidable impacts on wetland habitats in accordance with detailed mitigation and monitoring plans[2] (MMP). The MMP for each mitigation site shall be prepared by a qualified biologist and shall be consistent with all required permits. The final MMP shall fully compensate for direct and indirect impacts on wetlands and for the temporal, long-term, and permanent losses of wetland, functions, and services and shall include the following: a description of the resource types and amounts that will be provided; the methods of compensation; and the manner in which the resource functions and services will address the related project impacts.

The strategy for implementing the plan may include, but is not limited to, habitat creation, enhancement, restoration, or improvement of the sites described in **Table 5.13-7**, below. The locations of these potential mitigation projects are shown in **Figure 5.13-4**.

The final MMP(s) shall provide, at a minimum:

> *Compensation Goals and Objectives.* Fully compensate to achieve no net loss of habitat functions and services, as determined in consultation with natural resource permitting agencies, for construction impacts on 1.03 acres of wetland temporary impact, 0.45 acres of wetland permanent impact, 0.06 acres of permanent loss of a non-jurisdictional artificial pond,[3] and 136 linear feet of temporary and 113 linear feet of permanent riparian habitat within five years of the initiation of construction.
>
> Fully compensate to achieve no net loss of habitat functions and services, as determined in consultation with natural resource permitting agencies, for operational impacts on 13.5 acres of wetland permanent impact, including 7.7 acres (1,357 linear feet) of riparian habitat by restoring and establishing wetlands and riparian habitat on or in the vicinity of the Peninsula watershed lands. The SFPUC shall mitigate for all potential impacts "up front," in 2010–2012, at least three to four years in advance of potential operational impacts; depending upon timing associated with the increase in reservoir storage.
>
> *Site Selection.* The final compensation plan(s) shall include a description of the factors considered during the final mitigation site selection process, including consideration of watershed needs, onsite alternatives, and the practicability of accomplishing ecologically self-sustaining habitats at the mitigation sites. All sites selected must be known to support, or be able to support, breeding CRLF and SFGS.

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[2] The mitigation and monitoring plan (MMP) is a standard requirement for Corps permits and is separate and distinct from the Mitigation Monitoring and Reporting Program (MMRP) required under CEQA Guidelines Section 15097.

[3] The pond is used by California red-legged frog.

TABLE 5.13-7
POTENTIAL MITIGATION PROJECTS, LOWER CRYSTAL SPRINGS DAM IMPROVEMENTS PROJECT

Site Code*	Name and Location	Type of Mitigation Available for LCSDI Project	Current Status of Site	Project Components
MS-1	**Skyline Boulevard** Northern portion of San Andreas Reservoir in Peninsula watershed, west of the Skyline Boulevard and San Bruno Avenue intersection.	• wetland habitat • scrub habitat • pond habitat	Contains non-native pine and eucalyptus trees and non-native velvet grass and other non-native grasslands surrounded by native scrub habitat. A small seasonal wetland exists in the southern portion of the site where a paved fire road partially dams a small drainage. Site has been degraded by historical land uses and the presence of invasive non-native species.	• Remove one acre of non-native eucalyptus and plant with scrub vegetation. • Remove pine trees and other non-native vegetation and replace with plant scrub and seasonal wetland vegetation. • Within the seasonal wetlands area, small ponds will be excavated. • Construct new access roads.
MS-2	**San Andreas Reservoir** Northwest end of San Andreas Reservoir in Peninsula watershed.	• grasslands • riparian habitat • scrub habitat • wetland habitat	Site is dominated by scrub and non-native grassland habitats which are abundant in the surrounding area.	• Remove existing non-native grassland and scrub vegetation. • Excavate and plant wetland vegetation in wetland creation area. • Relocate portions of existing fire road off of Skyline Boulevard. • Install a concrete mat at a dip in the fire road for erosion control.
MS-3	**Upper San Mateo Creek** Northwest portion of the Peninsula watershed approximately two miles northwest of Lower Crystal Springs Reservoir along Trousdale Boulevard.	• wetland habitat • grasslands	Contains stands of non-native pine trees surrounded by scrub habitat and non-native grasslands. Past development has degraded the site and facilitated the invasion of the non-native pines.	• Remove non-native pine trees. Where pine trees are removed near existing seeps (southern portion of the site), ground disturbance would be limited to use of hand tools and tree stumps would not be removed. • For wetland creation areas, excavate and grade to create wetland basins and swales. • Construct inlet weirs and outlet structures in wetland creation areas. • Remove one existing culvert, rehabilitate second existing culvert that conveys water to San Mateo Creek. • Utilize spoils from grading to construct berm on western side of wetland area along existing road. • Plant native wetland vegetation in wetland area and native grassland species in upland areas; seed graded areas with an erosion-control mix.

TABLE 5.13-7 (Continued)
POTENTIAL MITIGATION PROJECTS, LOWER CRYSTAL SPRINGS DAM IMPROVEMENTS PROJECT

Site Code*	Name and Location	Type of Mitigation Available for LCSDI Project	Current Status of Site	Project Components
MS-4	**Skyline Quarry** North of Highway 92 in the western portion of the Peninsula watershed, and adjacent to the Fifield-Cahill Ridge Trail trailhead.	• riparian habitat • scrub habitat • wetland habitat	Contains trailhead, parking lot, restroom facilities, an unnamed intermittent stream channel, its active floodplains, and portions of adjacent upland landforms within the footprint of a former quarry. Past mining activities and invasion of non-native pampas grass on the site have degraded seasonal wetland and riparian habitat.	• Remove non-native pampas grass using mechanical and manual methods and herbicides. • Excavate mine tailings and plant with native wetland scrub vegetation. • Replace existing culvert located southwest of riparian enhancement area and replace culvert at a higher elevation. • Enhance riparian through grading and planting of riparian vegetation. • Reduce size of existing parking lot and relocate trailhead and restroom facilities.
MS-5	**Adobe Gulch Creek South** Southwestern portion of the Peninsula watershed.	• woodlands • wetland habitat • riparian habitat	Contains 3 acres of non-native eucalyptus trees adjacent to Adobe Gulch Creek and some riparian vegetation.	• Remove vegetation, excavate and grade a shallow depression, and plant native wetland vegetation in wetland creation area. • Install outlet channel to drain proposed wetland into Adobe Gulch Creek. • Stabilize Adobe Gulch Creek stream bank using bioengineering methods and planting native riparian trees and shrubs. • In oak woodland creation and enhancement area, remove up to 3 acres of selected eucalyptus trees. Grade and hydroseed tree removal area. • Plant oak trees and install temporary browse protection fencing.
MS-6	**Boat Ramp North** Directly upslope of the existing access road to a SFPUC boat launch west of Skyline Boulevard in the eastern portion of the Peninsula watershed next to Lower Crystal Springs Reservoir, about ½ mile north of Highway 92.	• wetland habitat	Contains a seasonal wetland formed by the impoundment of runoff by the roadway embankment.	• Excavate grasslands and remove non-native vegetation near existing seasonal wetlands. • Raise access road to improve drainage and replace existing culvert with a larger culvert to provide for wildlife passage. • Plant native wetland vegetation.

TABLE 5.13-7 (Continued)
POTENTIAL MITIGATION PROJECTS, LOWER CRYSTAL SPRINGS DAM IMPROVEMENTS PROJECT

Site Code*	Name and Location	Type of Mitigation Available for LCSDI Project	Current Status of Site	Project Components
MS-7	**Adobe Gulch** Near Highway 92 in the southwestern portion of the Peninsula watershed, west side of Upper Crystal Springs Reservoir	• oak woodland • wetland habitat	Largely consists of scrub habitat, coyote brush, poison oak, and small trees.	• Remove poison oak and coyote brush using mechanical means, goat grazing, manual removal, and/or herbicides. • Remove non-native cypress trees and plant oak trees within tree removal area. • Install temporary browse protection, irrigation pipeline and water storage tank for new oak trees. • Remove or modify existing access roads and construct a new permanent access road. • For wetland creation area, remove vegetation, excavate shallow depressions, plant native wetland vegetation, and replace abandoned road with ephemeral and intermittent drainage.
MS-8	**Boat Ramp South** Adjacent to Skyline Boulevard in the eastern portion of the Peninsula watershed next to Lower Crystal Springs Reservoir, about ¼ mile north of Highway 92.	• woodlands • wetland habitat • riparian habitat • scrub habitat • grasslands	Contains non-native pine trees, grasslands, and shrubs.	• Remove non-native pine trees. • Plant fountain thistle and native grassland species. • Manage fountain thistle enhancement and grassland areas through tree and brush control, active seeding, or out-planting of fountain thistle and butterfly host species.
MS-9	**Half Moon Bay / Pilarcitos** City of Half Moon Bay, adjacent to and south of Highway 92, within the historic floodplain of Pilarcitos Creek	• wetlands/pond • riparian habitat	Currently used as a corporation yard for Half Moon Bay Public Works. The site contains agricultural plots covered in black plastic tarp that are surrounded by irrigation ditches and gravel roads, which are all remnants of the former ornamental plant nursery at the site. The site also contains buildings and structures that appear to be older than 50 years—the minimum age threshold for potential eligibility for the National Register of Historic Places.	• Remove existing structures, concrete pad, and paved and gravel roadways. • Remove non-native vegetation. • Excavate pond area to capture runoff, and regrade site. • Install temporary irrigation. • Plant riparian plants.

*See Figure 5.13-4 for the location of sites.

Site Protection Instrument. The final compensation plan(s) shall include a description of the legal arrangements and instruments, including site ownership, used to ensure the long-term protection of the compensation sites.

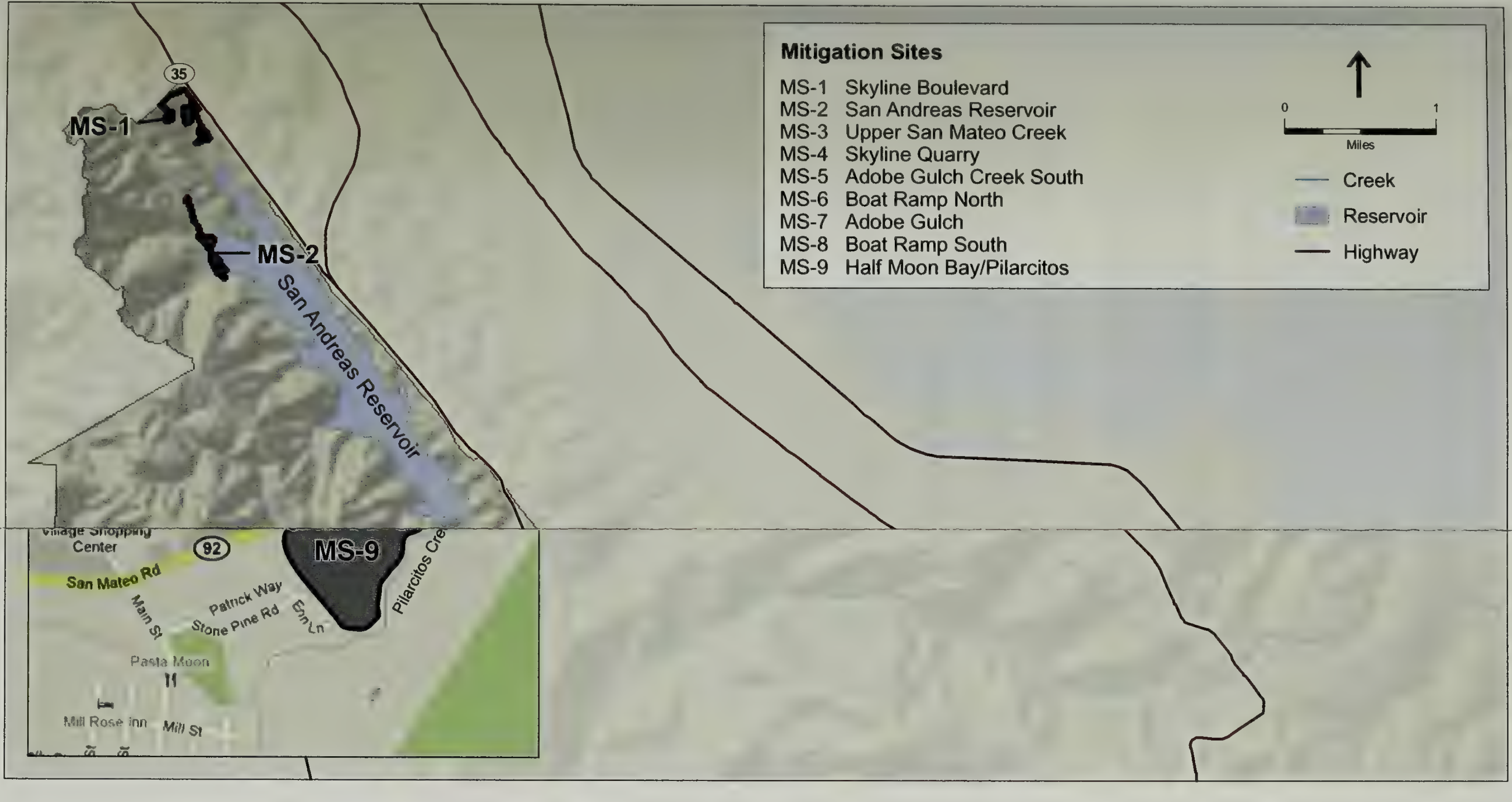
Baseline Information. The final compensation plan(s) shall include descriptions of the ecological characteristics of the impact sites and their associated proposed compensation sites. This shall include descriptions of historical and existing plant communities, historical and existing hydrology, soil conditions, a delineation of waters of the state and U.S., a map showing the locations of the impact, and mitigation sites, and other site characteristics appropriate to the types of resources proposed as compensation (e.g., characterization of suitability for CRLF and SFGS).

Compensation Plan. The final MMPs shall specify the compensation for all habitat types addressed in the plan(s) needed to achieve no net loss of habitat areas, functions, and services, and the rationale used to determine their sufficiency. Factors considered in determining the adequacy of the compensation shall include:

- The quality of the affected habitat compared with the potential of the compensation site
- The similarity of the compensation site to the affected habitat in terms of site potential (soil, topographic, and hydrologic characteristics) and proposed vegetation composition and structure
- The timing of compensation site development in relation to the anticipated loss of existing habitat
- The connectivity of proposed compensation habitat with existing, occupied habitat
- The likelihood of success of the proposed enhancement actions
- The differences between the habitat functions and services lost and those expected to be provided by the compensation
- Temporal losses of resource functions and services
- The difficulty of restoring or establishing the desired habitat types and functions
- The distance between the affected habitat and compensation sites

Mitigation Work Plan. The final MMP(s) shall include detailed written specifications and work descriptions for the compensation projects, including but not limited to: the geographic boundaries of the projects; construction methods; timing and sequence; sources of water, including connections to existing waters and uplands; soil properties (e.g., particle size, organic content, etc.); methods for establishing the desired plant communities; plans to control invasive plant and animal species; dewatering plans, as applicable; proposed grading plans, including the elevation and slope of the substrate; soil management; and erosion control measures.

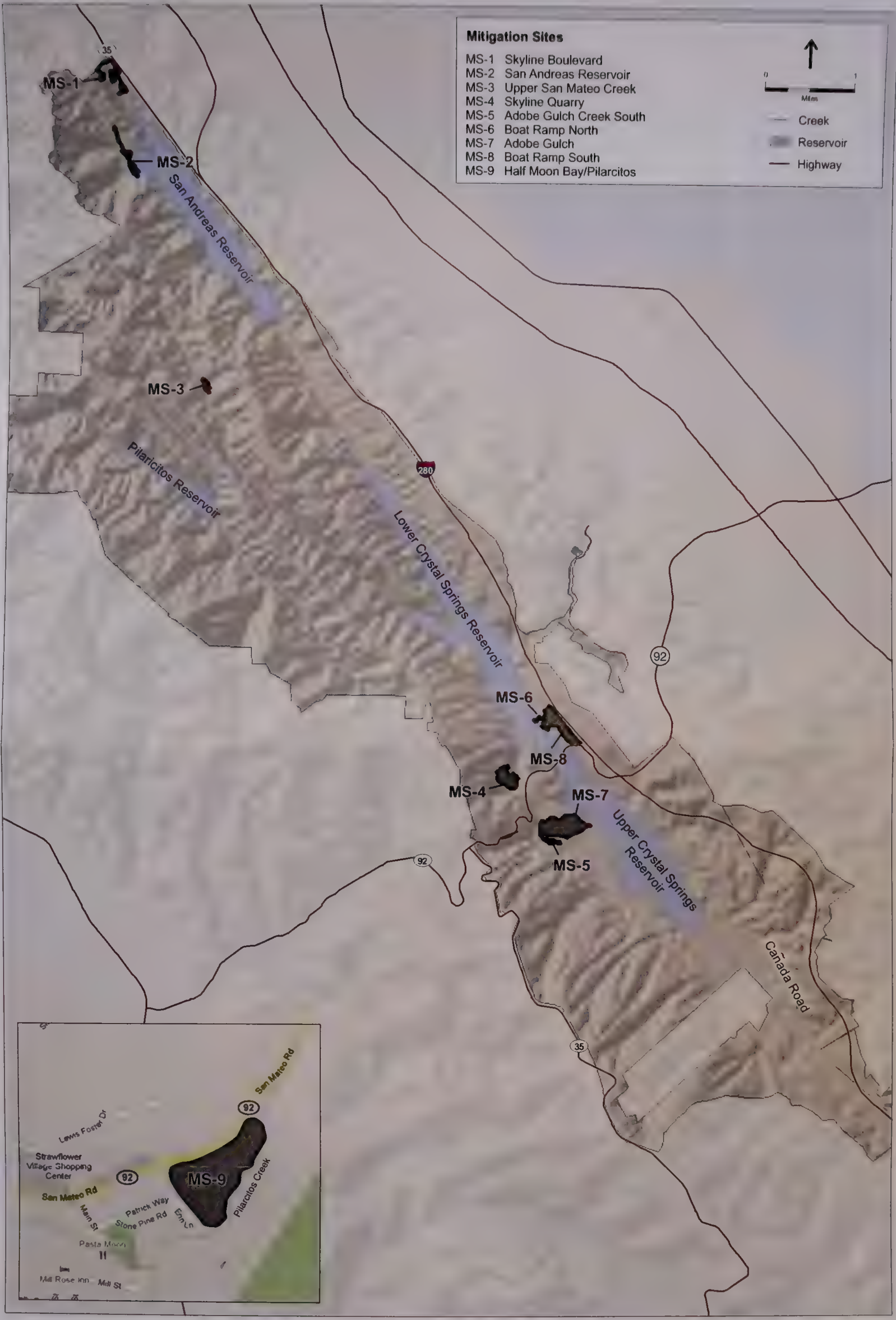
Maintenance Plan. The final MMP(s) shall include a description and schedule of maintenance requirements to ensure the continued viability of the habitats once initial construction is completed, and a program to regularly reduce non-native predatory amphibians and fish.



SOURCE: ESA + Orion, 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 5.13-4
Mitigation Sites



SOURCE: ESA + Orion, 2009

Figure 5.13-4
Mitigation Sites

Success Criteria. The final MMP(s) shall include ecologically based criteria for use in determining whether the compensation projects are achieving their objectives. The success criteria shall be based on attributes that are objective and verifiable.

Monitoring Plan. The final MMP(s) shall include a description of parameters to be monitored to determine whether the compensation projects are on track to meet performance standards. A schedule for monitoring and reporting on monitoring results must be included. Monitoring and reporting shall continue for five years, or the length of time required by regulatory agencies.

Long-Term Management Plan. The final MMP(s) shall describe how the compensation sites will be managed after the performance standards have been achieved to ensure the long-term sustainability of the resources, including long-term financing mechanisms and the party responsible for long-term management.

Individual Tree Replacement

Measure M-BI-2: For each removed tree protected by the San Mateo County Significant Tree Ordinance (defined as any live woody plant rising above the ground with a single stem or trunk that has a 4-inch dbh or greater[4], the SFPUC shall plant a long, 1-gallon pot replacement tree of the same species. If replanting trees on the same site is not feasible, the SFPUC shall designate a suitable planting site on the Peninsula watershed. Planting shall occur within one year after construction is completed. See Mitigation Measure M-BI-7b, below, for a description of performance criteria.

Frog Relocation

Measure M-BI-3a: During the breeding season and preceding construction on the dam surface, all frog eggs and tadpoles shall be moved to a suitable refugium on Peninsula watershed lands, at a location deemed acceptable by the USFWS and the CDFG. Work shall be conducted by biologists with valid agency authorization.

Exclusion Fence

Measure M-BI-3b: The SFPUC shall ensure that the LCSD work areas (i.e., areas with ground disturbance or off-pavement vehicle activity) are fenced along a perimeter that encompasses the entirety of the work areas at and below the LCSD. The fence will be made of 4- by 8-foot plywood panels joined lengthwise, or an equivalent fence type as approved by the regulatory agencies, with escape funnels to allow egress from but not access to the site by SFGS and CRLF. The following actions shall be taken to avoid mortality during the initial site clearance and fence installation: use of hand held tools to clear low-lying vegetation and hand held power tools (e.g., chain saw) to clear trees prior to use of ground disturbing equipment (e.g., small bobcat), and trapping and relocating frogs out of the excavation area. Work shall be conducted by biologists with valid agency authorization, and any red-legged frogs shall be relocated outside the fenced area.

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[4] The SMC tree ordinance applies to trees 12 inches dbh pr greater; thus this EIR replacement standard is more conservative.

Biological Monitoring

Measure M-BI-3c: During project construction, an environmental inspector (EI) who is familiar with the identification and life history of CRLF, SFGS, and other potentially present special-status species, and with the appropriate agency authorization, shall be designated to periodically inspect onsite compliance with all mitigation measures, consistent with the worker awareness program (Mitigation Measure M-B-1a).

The EI shall perform a daily survey of the entire project area during initial ground-breaking activities and during the rainy season. During these surveys, the EI shall inspect the exclusion fencing for individuals trapped within the fence and determine the need for fence repair. After ground-breaking activities and during the non-rainy season, the inspector shall continue to perform daily fence surveys and compliance reviews at the project site. The EI shall operate under the direction of a project environmental compliance manager and shall have one or more specialty environmental monitors on call, with a valid permit to handle listed species. The specialty monitor shall direct all personnel in regards to interactions with sensitive species, perform authorized species relocations, and supervise all reporting on such species.

Preconstruction Surveys and Avoidance of Nesting Birds

Measure M-BI-3d: If construction activities (i.e., ground clearing and grading, including removal of trees or shrubs) are scheduled to occur during the nonbreeding season (September 1 through January 31), no mitigation is required.

If construction activities are scheduled to occur during the breeding season (February 1 through August 31), the SFPUC shall implement the following measures to avoid potential adverse effects on nesting raptors and other special-status birds:

- A qualified wildlife biologist shall conduct preconstruction surveys for active nests within 300 feet (for raptors) or 100 feet (for migratory birds) of ground-disturbing activities, where access is available. These surveys will include ground-nesting species in grasslands (e.g., burrowing owl).

- If active nests (eggs/chicks present) are found during preconstruction surveys, the SFPUC shall establish a no-disturbance buffer (acceptable in size to the CDFG) around active raptor nests and nests of other special-status birds during the breeding season, or until it is determined that all young have fledged. Typical buffers are 300 feet for raptors and 100 feet for other nesting birds. The size of these buffer zones and the types of ground-disturbing activities restricted in these areas may be further modified during coordination with the CDFG and shall be based on existing noise and human disturbance levels at the project area. Nests initiated during construction are presumed to be unaffected, and no buffer would be necessary. If preconstruction surveys indicate that nests are inactive or potential habitat is unoccupied during the construction period, nesting substrate (i.e., trees, shrubs, and buildings) in this area can be removed, and no further mitigation is required.

- If there is a break of at least five days in construction activities during the nesting season, an additional nesting bird survey shall be conducted to ensure that no birds have occupied nests during the pause in construction activity.

Avoidance of Roosting Bats

Measure M-BI-3e: For trees to be removed, a qualified biologist shall identify those that show evidence of roosting use by any of the six special-status bat species that might occur in the project area. The SFPUC shall remove identified maternity roost trees only after the young are volant (capable of flying), normally between August and mid-October. If a maternity roost is located within the construction area, treatment of known maternity roosts, including active relocation, may be considered in consultation with the CDFG.

If a non-maternity bat roost is detected, a qualified biologist shall remove it using methods such as: (1) opening the roost area to allow airflow through the cavity, making the roost unsuitable for bats prior to the start of tree removal, or (2) excluding the bats using one-way doors, funnels, or flaps.

Preconstruction Clearance Surveys for San Francisco Dusky-Footed Woodrat

Measure M-BI-3f: The SFPUC shall ensure that a qualified biologist conducts a survey for woodrat middens (i.e., nests) within all limits of construction prior to the initiation of clearing or grading in any given location. This survey should be conducted early enough to address any middens requiring removal prior to site clearing. If no middens are found within such areas, no further action is required. If middens are found and can be avoided, the biologist shall direct the contractor in placing orange barrier fencing or flagging between the proposed construction clearing and the midden, giving as much room as possible to avoid indirect disturbance to the midden, but no less than a minimum distance of 2 feet from and along the construction side of the middens to protect them from construction activities.

If the minimum fencing distance cannot be achieved and the middens cannot be protected and/or avoided, a qualified biologist shall disassemble middens, or, if adjacent habitat is not suitable, trap and relocate woodrats out of the construction area (using live traps) prior to the start of construction. In addition, the biologists shall attempt to relocate the disassembled midden to the same area where the woodrats are released. If young woodrats are present during disassembling, the biologists shall discontinue disassembling and return at least 24 hours later to allow time for the young to be relocated.

General Avoidance Measures

Measure M-BI-3g: The SFPUC and its contractors shall minimize construction impacts on other wildlife as follows:

- During project activities, all trash that could attract predators to potentially present special-status species shall be properly contained and removed from the worksite daily. Following construction, the construction contractor shall remove all trash and construction debris from work areas. In addition, vegetation waste management shall be practiced to help ensure that trees, shrubs, debris, soils, or construction materials are not inadvertently placed below the ordinary high-water mark of any streams or riparian areas.

- The number of access routes, the use of staging areas, and the total area of the activity shall be limited to the minimum necessary to complete construction and, in coordination with the qualified biologist, shall be delineated on the project drawings before work begins. The routes and boundaries shall be outside riparian and wetland areas to the greatest extent possible.

- The construction contractor shall confine all equipment and construction operations to the work areas, generally defined by exclusion fencing.
- Project-related vehicles shall observe a 15-mph speed limit on unpaved roads through the project areas.
- No pets or firearms shall be allowed in the project areas.
- If worksites require dewatering, the intakes shall be screened with a maximum mesh size of 5 millimeters.
- All erosion control materials shall be free of weeds and plastic monofilament and nylon wire (erosion control blankets and mats backed with plastic and nylon netting are known to entrap and injure amphibians and snakes).
- Project personnel shall immediately report any harm, injury, or mortality of a special-status species during construction, including entrapment, to the construction foreman or biological monitor. The construction foreman or monitor shall immediately notify the SFPUC, which will provide verbal notification to the USFWS and/or to the local CDFG warden or biologist (as applicable) within one working day of the incident. The SFPUC shall follow up with written notification to the USFWS and/or CDFG (as applicable) within five working days of the incident. The biological monitor shall submit all observations of special-status species to the CNDDB.

Serpentine Grasslands Enhancements

Measure M-BI-7a: The SFPUC shall identify a site with at least 10 acres of degraded or potential serpentine grassland (e.g., the Boat Ramp South site described in Table 5.13-7 above), sufficient to fully compensate to achieve no net loss of habitat functions and services as determined in consultation with natural resources permitting agencies for impacts on 8.3 acres of serpentine bunchgrass. The site, or another site deemed appropriate by a qualified biologist, shall be restored by removing trees, brush, and litter; using herbicides to remove invasive weeds; and planting native serpentine grassland species. Site preparation and planting shall be completed prior to implementation of the proposed operations (i.e., before the SFPUC begins raising the maximum normal reservoir elevations from 283.8 to 287.8 feet). As described in Mitigation Measure M-BI-1c, restoration shall be carried out in accordance with an MMP that specifies goals and objectives; the rationale for the site selected and intended actions; a detailed work plan; a maintenance plan; success criteria, such as percent cover of native perennial bunchgrasses or native bunchgrass species richness; a monitoring plan; and a long-term management plan. This mitigation measure shall be carried out in conjunction with Mitigation Measure M-BI-8a, Listed and Nonlisted Special-status Plants, described below.

Oak Woodland Mitigation Program

Measure M-BI-7b: To ensure there is no net loss of oak woodlands due to normal reservoir operation and exceedances, the SFPUC shall replant, preserve, or enhance oak woodlands. Given the complexity of the actions proposed, and the different time periods required for different forms of mitigation, the SFPUC shall implement a combination of compensation methods, described below as Options A, B, and C. Compensation for project impacts on oaks will be achieved through the replanting of approximately 20 acres of oak woodland (Option A, below) and preservation and/or conservation of approximately 20 acres of existing, at-risk oak woodland (Options B or C, below). The final plan(s) for each option shall specify the compensation option(s) chosen to achieve no net loss of habitat areas, functions, and services, and the rationale used to determine this compensation. In developing these plan(s), the SFPUC shall consider the following factors to determine the appropriate extent of which mitigation options to implement:

- The likelihood of success
- Differences between the habitat functions and services lost and those expected to be provided by the mitigation
- Temporal losses of resource functions and services
- The difficulty of restoring or establishing the desired habitat types and functions
- The distances between the affected habitat and compensation sites

Under the terms of the project description (Chapter 3, Section 3.7), reservoir levels shall not exceed 287.8 feet until at least three years after completion of the LCSDI project. The SFPUC shall identify its preferred mitigation option(s) for the final oak woodland mitigation program within those three years, although mitigation may be initiated sooner in order to minimize temporal losses. The three options are as follows:

> ***Option A. Replanting Program.*** The SFPUC shall offset oak woodland impacts by creating new oak woodland habitat through an oak woodland replanting program. The SFPUC shall identify oak woodland replanting sites according to the criteria set forth in section A.1 below; sites are subject to the monitoring and performance criteria described in section A.2. Due to the large acreage of potentially affected oak woodlands and because of the time necessary to establish successfully replanted oak woodlands, Option A shall account for no more than 50 percent of the oak woodland mitigation.
>
> A.1 Planting sites shall be selected based on the current lack of coast live oaks and demonstrable suitability of a site to support coast live oak woodland, such as soil type and depth, slope, and aspect. A typical suitable site would have historical evidence of past coast live oak woodland and would be strongly dominated by non-native species. In such cases, existing vegetation would be more or less fully removed before planting oaks.
>
> A.2 For all oak/oak woodland replanting efforts, a Site Replanting Plan shall be developed by a qualified biologist prior to implementation. This plan shall discuss the specifics of implementing the replanting and long-term monitoring of the oak woodland mitigation sites. The site replanting plan shall include the following components:

Purpose and goals. The purpose of the Site Replanting Plan is to provide a detailed set of specifications for correct implementation of oak woodland restoration. Site Replanting Plan goals include: restoring oak woodland habitat within the same watershed as the LCSDI project in order to provide local wildlife habitat, maintain aesthetic value, and preserve open space. Off-watershed planting projects will be considered if oak silviculture would be less environmentally impacting than any proposed LCSDI watershed site.

Identification of responsible parties. The SFPUC shall be responsible for ensuring that restoration and monitoring are implemented according to the plan. A restoration monitor (a qualified biologist or restoration ecologist) shall be retained by the SFPUC to oversee the replanting project and to implement the plan.

Implementation of replanting. Replanting would be implemented within 4 years of EIR certification.

Planting specifications. These include: design drawings, planting palette, local plant sources, plant spacing, irrigation, erosion control, debris removal, weed eradication, plant installation, screening for plant pathogens if seedlings are to be planted, and plant protection measures.

Success and performance criteria. The mitigation shall be deemed successful if, after 10 years, total percent cover of oak trees increases incrementally over a five-year monitoring period; and total percent cover should be a minimum of 50 percent.[5] Performance standards shall also include the minimum requirements for the legal instruments imposing preservation/conservation of replanted sites in perpetuity.

Long-term monitoring methods. This section of the plan shall include a description of the scientifically based methods to be used to quantitatively measure plant growth and establishment as they apply to the success criteria. Methods should include: line-intercept sampling to determine overall percent cover and percent cover of oak trees, a comprehensive count of all planted woody individuals and an assessment of their health, and height and canopy measurements of all oak trees. A photo-documentation protocol shall also be established whereby photos of the replanting site and reference sites are taken from the same vantage point during annual monitoring.

Maintenance, monitoring, and reporting schedule. Maintenance shall be conducted at least twice a year at the restoration site—once during the spring and once during the summer, or more frequently if deemed necessary by the restoration monitor until the success criteria are met. Maintenance shall include: non-native species removal, erosion control maintenance, and maintenance of plant protection measures. Monitoring of the restoration site shall occur once annually in the late spring (May), except during the first year after completion of planting, when it will occur both in the spring (May) and fall (August). Additionally, shortly after the completion of planting, a baseline monitoring visit shall take place, during which the restoration monitor would conduct the first round of monitoring. A report of the baseline conditions will be included in the first year monitoring report. The restoration monitor shall prepare annual reports, which will include an evaluation of the success of the project against the success criteria; the reports will be submitted to the SFPUC and the San Francisco Planning Department, Environmental Review Officer by the end of each calendar year. In the event that restored areas do not meet the success criteria, remedial actions will be taken. Remedial actions may include: replanting, additional weed maintenance, installation of additional erosion control or plant protection materials, or modifications to an irrigation system. An analysis of the site conditions and project success shall be included in each annual monitoring report, which will provide suggested remedial actions.

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[5] Oak plantations, for a number of reasons, perform less successfully than other types of silviculture. In one study comparing several planting techniques, Plumb (1996) found survival of only 37.1 percent; 60 percent was only attained after replanting. Fifty percent total cover is therefore a reasonable goal if an entire site is evenly planted.

Option B. SFPUC preservation of local oak woodlands. The SFPUC may offset oak woodland impacts by establishing oak woodland preservation and enhancement sites in the CCSF-owned Peninsula watershed. Oak woodland preservation and enhancement sites shall be identified by applying the factors set forth in section (B)(1) below; sites are subject to the monitoring and performance criteria described in section (B)(2).

B.1 *Preservation and Enhancement Sites*

Preservation Sites. The intent of the preservation site is to identify two to three stands of oak woodland on the Peninsula watershed that are largely intact but considered at risk, and to proactively and aggressively manage the stands for long-term health and reproduction. The current threats to extant stands may include, but are not limited to, Sudden Oak Death or other pathogen, lack of natural regeneration (senescence), or potential threats from human activity. Any preservation site must provide oak woodland benefits which would not be part of normal watershed management; (i.e. the selected stands would be managed in perpetuity independent of other watershed operations, and techniques reviewed and revised every five years consistent with an adaptive management program).

As part of the preservation classification, the SFPUC will apply its ongoing Sudden Oak Death management actions as an element of the oak woodland mitigation program at the designated sites. The current SFPUC activities on the Peninsula watershed have several relevant constituent elements, including:

- Treatment of mature healthy tanoak trees with Agrifos or an equivalent product shown in nursery settings to protect oak trees from Sudden Oak Death.
- Treatment of selected "heritage" (larger and older) coast live oak trees with Agrifos (or an equivalent product).
- Removal of California bay to reduce the risk of Sudden Oak Death in coast live oaks. In coastal California forests, California bay is the primary source of the Sudden Oak Death pathogen; infected coast live oaks are usually found within a few meters of an infected bay tree.
- Monitoring of control areas initially containing healthy coast live oak trees.

In addition to these ongoing actions to manage and control Sudden Oak Death, preservation sites could also be managed to maximize the productivity and volume of oaks and diversity of the woodland as a community type. Such actions would be consistent with accepted silvicultural methods, and could include the following:

- Pruning and thinning to maintain a diversity of ages and sizes of coast live oaks

- Repair of erosional areas, roads, and culverts to preserve ecosystem quality
- Control feral animals like pigs, which are detrimental to ecosystem quality.

Enhancement Sites. Option A.1 would apply to sites where oaks are restored exclusively through replanting. However, in some areas on the Peninsula watershed, rapidly growing Monterey pine appear to overtop grassland and shrubland with extant young coast live oak, and without this competition, site conditions (in the absence of fire) appear to favor the eventual development of coast live oak woodland. Sites such as these would be *enhanced.* Specifically, Monterey pine would be removed, with some dead trees left as snags.

B.2 *Similar to Option A, a site plan (preservation or enhancement) shall be prepared for each site under Option B*.

Prior to implementation, the SFPUC shall develop an Oak Woodland Preservation Plan in consultation with a qualified specialist for identified preservation and enhancement sites. The plan shall involve testing, evaluating, and implementing multiple concurrent strategies for Sudden Oak Death control and management strategies to maximize the chance of retaining coast live oak woodland resources. Components of the plan shall include:

- A methodology for site-specific risk assessment for Sudden Oak Death or other factors that would be likely to influence success at a particular site (species composition, topography, hydrology, pathogen presence, etc.)
- Strategic selection of target areas for improving regeneration, mature oak retention, and manipulation of species composition or other habitat elements
- A multi-pronged Sudden Oak Death prevention effort that could include Agrifos (or an equivalent product), bay removal, mulching, and other strategies
- Identification of trees with evidence of resistance to Sudden Oak Death, and the use of these trees as a source of locally derived planting stock while retaining maximum genetic diversity
- Ongoing monitoring and adaptive management to incorporate new knowledge as it becomes available

An Oak Woodland Enhancement Plan shall be developed for any LCSDI enhancement site, similar in organization and content to the Site Replanting Plan described under A.2, above, i.e., Purpose and goals of the project; Identification of responsible parties; Treatment specifications; Success criteria or performance standards; Long term monitoring methods; and Maintenance, monitoring, and reporting schedule.

Option C. Contribution to Oak Conservation Funds or Actions on Other Open Space Lands. If this option is selected, the SFPUC shall offset oak woodland impacts by contributing mitigation funds to other land trustee agencies (e.g., Peninsula Open Space Trust, Midpeninsula Regional Open Space District) or to a private landowner for use in purchasing oak woodlands threatened by development or for preservation, enhancement, or planting efforts. These woodlands would be outside the CCSF-owned watershed but within Santa Clara, Alameda, or San Mateo Counties. Payment for conservation through an oak mitigation fund or as a financial grant to the landowner for a conservation easement would offset the loss of oak woodlands affected by the LCSDI project. The price per acre for contributions under Option C shall be based on the primary costs of the action contemplated by the landowner, plus the costs of any follow-up actions (e.g., monitoring) for a period of five years. If purchased from a private landholder, the SFPUC shall ensure all legal instruments are in place so that the oak woodlands are preserved in perpetuity.

Listed and Nonlisted Special-status Plants

Measure M-BI-8a: This mitigation measure shall be carried out in conjunction with Mitigation Measure M-BI-7a. Mitigation for impacts on 0.30 acre of fountain thistle and 0.002 acre of Marin western flax shall be carried out at a specific site with the potential to support these species, as determined by a qualified biologist. An example would be the Boat Ramp South site described above in Table 5.13-7. Habitat would be replaced to achieve no net loss of habitat functions and services for the species, as determined in consultation with natural resource permitting agencies. It is expected that serpentine spring habitat will form naturally at higher elevations than at present due to the rise in groundwater resulting from higher reservoir operating elevations. Increased flows in existing zones of serpentine seeps may also occur naturally if the water demands by non-native trees are removed. Removal of non-native trees, together with the predicted change in hydrology, will create suitable mitigation habitat. Increased habitat for Marin western flax is expected to form where non-native woodland and accumulated litter and duff on serpentine soil are removed and grassland restored to the site. Enhanced and restored occupied habitat shall be equal in extent to the predicted loss of habitat below the 291.8-foot elevation.

For impacts on all other special-status plants—western leatherwood (0.09 acre), San Francisco collinsia (0.01 acre), and Franciscan onion (0.02 acre)—that cannot be avoided, the SFPUC shall fully compensate to achieve no net loss of habitat functions and services. To the extent feasible, habitat enhancement shall take place at sites already planned for other mitigation for this project; if habitat is not suitable at those sites, habitat enhancement would be carried out at appropriate nearby sites through strategies such as transplantation, relocation or seed harvest.

Mitigation for impacts on Crystal Springs lessingia (2.59 acres) would be similar to that for Marin western flax; that is, removal of non-native trees and grassland management to reduce competition from non-native herbs and grasses. This measure would be carried out on sites that are known to contain serpentine-derived soils (i.e., Obispo clay or Fagan loam), are dominated by non-native grasses at present, and do not currently support Crystal Springs lessingia but appear to have site potential to support this species. Management of the grassland for serpentine bunchgrass species would also improve habitat for Crystal Springs lessingia, such as removing trees, litter, and duff and reducing competition from non-native grasses and herbs. This management strategy is also expected to provide additional habitat for Franciscan onion.

All habitat improvements shall be carried out prior to the implementation of the increased maximum normal reservoir operating elevation. For the first five years following the reservoir elevation reaching a sustained operating maximum of 287.8 feet, the SFPUC shall carry out annual surveys to determine the effectiveness of the habitat improvements.

Scrub and Grassland Enhancement for Upland Refugia

Measure M-BI-8b: A total of 34.8 acres of upland refugia for SFGS (consisting of 13.8 acres of scrub and 21.0 acres of grasslands) and potential WPT nesting habitat will be lost due to the increase in maximum normal operating elevation from 283.8 to 287.8 feet. The SFPUC shall identify a site with at least 35 acres of degraded scrub and grassland habitat and manage the site(s) by removing trees and invasive weeds to enhance scrub and grassland habitat for upland refugia for SFGS and potential WPT nesting habitat.

Predator (Bullfrog) Control

Measure M-BI-8c: Under Impact BI-8, this EIR concluded that inundation is unlikely to cause direct mortality of SFGS; however, snakes that exit a winter retreat may be exposed to an increased risk of predation. To mitigate the effects of a possible net decline in SFGS productivity, the SFPUC shall institute a predator (predominantly bullfrog) control program once each year for ten years in areas where compensatory productivity increases could be most effectively obtained: Tracy Lake and Golf Course ponds. In addition, all sites used for mitigation (consistent with WSIP PEIR Mitigation Measure 4.16.4a) will be subject to long-term control actions for non-native species. Predator control would consist of annually draining permanent ponds and capturing and removing bullfrogs.

Fish Rescue and Relocation

Measure M-BI-12a: The SFPUC shall implement the following measure in conjunction with Mitigation Measures M-BI-1a (Worker Training Program), M-BI-1b (Avoidance and Restoration), M-BI-3b (Exclusion Fence), M-BI-3c (Biological Monitor), M-BI-3g (General Avoidance), and M-HY-3 (Preparation of a SWPPP) to avoid direct impacts on steelhead and to minimize the potential for injury or mortality from construction activities within lower San Mateo Creek related to instream activities, dewatering operations, and fish rescue and relocation efforts.

Prior to commencing dewatering activities in lower San Mateo Creek (including the stilling basin vicinity, Pool 1, and the intervening shallow channel), the SFPUC shall develop a fish rescue and relocation plan in consultation with a qualified fisheries biologist, CDFG, and NMFS. The plan shall include stipulations that a qualified fisheries biologist with a current CDFG scientific collections permit conducts the fish rescue and relocation effort to rescue and relocate fish from areas isolated for dewatering. The fish rescue effort shall be implemented during dewatering of the instream construction area. At a minimum, the fish rescue and relocation plan shall include the following measures:

- Installation and removal of all temporary dewatering equipment will be conducted under the guidance and supervision of a qualified biologist with a current CDFG scientific collection permit to avoid injuring or killing aquatic species within the work area.

- Prior to dewatering the instream construction zone, a qualified biologist will use NMFS-approved methods to rescue and relocate aquatic species to suitable habitat downstream of the construction zone.

- Fish collected during the rescue operation will be transported to insulated coolers with sufficient aeration systems to maintain suitable water quality conditions. A sufficient number of coolers will be available to separate species and age classes as appropriate to avoid predation.
- Rescued fish will be relocated downstream to suitable equivalent pool habitat, and multiple potential release locations will be identified in order to avoid increased predation potential or overcrowding at a single site.
- Initial dewatering will be conducted under the supervision of a qualified biologist to reduce potential injury or mortality to juvenile steelhead and other aquatic species from stranding.
- Dewatering intakes will be screened with mesh in accordance with NMFS fish screening criteria for anadromous salmonids as outlined in the NMFS's Water-Drafting Guidelines (NMFS, 2001).
- Captured fish will be identified and counted. A technical memorandum documenting rescue operations, species observed, numbers of each species (including the number of any dead or injured juvenile steelhead), and the location of their release will be prepared and submitted to the CDFG and NMFS following rescue operations.

Vibration Monitoring

Measure M-BI-12b: In the event that blasting is used for demolition and excavation in the stilling basin and that blasting techniques using charges greater than 20 pound per delay are required, the SFPUC and/or its contractor shall conduct vibration monitoring during blasting activities to verify and validate the local geologic conditions relating to blasting-related vibration and to adjust the blasting technique appropriately (charge strength per delay) to ensure that the NMFS criterion limit of 100 kPa (220 dB) peak sound pressure level and 187 dB SEL for underwater sound pressure levels are not exceeded at Pool 2. This measure will avoid direct impacts on steelhead and minimize the potential for injury or mortality from construction activities relating to use of blasting during excavation.

Enhancement of Existing Fisheries Habitat

Measure M-BI-13: The SFPUC shall compensate for permanent losses of rearing habitat for CCC steelhead through enhancement of existing suitable aquatic habitat near Pool 2 by implementing at a minimum the measures described below. Currently, approximately 100 linear feet of the south bank of Pool 2 consists of riprap for erosion control. The borders of Pool 2 are currently devoid of riparian vegetation and Pool 2 is unshaded and lacks cover. To enhance the quality of rearing habitat in Pool 2, SFPUC shall vegetate the existing riprap using techniques identified by a revegetation specialist. Source material will consist of locally native riparian vegetative species. These improvements will compensate for the lost habitat values resulting from the permanent removal of Pool 1 and the associated loss of riparian vegetation and shaded riverine aquatic cover. Minimum success and monitoring criteria for this enhancement site shall contain, at a minimum, the following restoration objectives:

- *Removal of concrete blocks in Pool 2*. Pool 2 contains two concrete blocks measuring 5 feet wide by 13 feet long, and 4 feet wide by 6 feet long. The SFPUC shall remove these concrete blocks to increase the area of open-water habitat in Pool 2.

- *Enhance Aquatic Habitat*. Instream cover (e.g., large woody material) shall be added to Pool 2 and additional riparian plantings shall be placed along existing unvegetated natural bank areas of the pool (see next bullet).

- *Enhance Riparian Vegetation by Pool 2*. The SFPUC shall provide shaded riverine aquatic cover[6] to the creek along Pool 2 to improve the quality of the pool for rearing juvenile steelhead. The SFPUC shall develop a revegetation plan, which will include specific monitoring and performance criteria to ensure successful establishment of the habitat described here within 3 years of completion of construction. At a minimum, the revegetation plan will contain the following performance criteria:

  - Riparian vegetation plantings should be established within 15 feet (horizontal distance) of the water's edge.

  - Vegetation should be planted with the goal of being sufficiently dense at maturity to provide overhead canopy along at least 85 percent of the streambank's length.

  - The species composition will be comparable to undisturbed riparian vegetation along lower San Mateo Creek.

  - The revegetation plan will specify both overstory and understory plantings to maximize shading and bank stabilization. These plantings will be species known to occur along the San Mateo Creek riparian corridor.

  - Plantings will be protected from herbivory by collars and screens, as appropriate, and weed matting will be placed around each planting and anchored in.

  - Planting will take place during early winter (December–February). After planting is completed, a planting layout will be prepared showing the location and species of each planting.

  - Depth to water table will be measured periodically by the use of pipe wells consisting of perforated drain pipe. Such monitoring will determine the need for supplemental irrigation.

  - Performance standards will include 90 percent survival of plantings at the end of the first year, and 75 percent survival of plantings at the end of the second year.

As described in Section 5.13.3.7, in order to avoid additional impacts on biological resources associated with implementation of the above measure, biological mitigation measures shall apply to this measure to prevent or otherwise minimize impacts of habitat enhancement activities on surrounding biological resources. All relevant biological mitigation measures identified in Section 5.13.3.6 apply to this mitigation measure, including Mitigation Measures M-BI-1a (Worker Training Program), M-BI-1b (Avoidance and Restoration), M-BI-3b (Exclusion Fence), M-BI-3c (Biological Monitor), M-BI-3d, 3e, 3f (Preconstruction Surveys), and M-BI-3g (General Avoidance).

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[6] Shaded riparian aquatic (SRA) cover is defined by the USFWS as the unique nearshore aquatic cover occurring at the interface between a river and adjacent riparian habitat. SRA cover provides fish, including steelhead, with protection from predators, maintains shade necessary to reduce thermal input to the creek, and provides nutrients to the creek in the form of fallen leaves and insects. Riparian vegetation is also important in controlling streambank erosion, contributing to instream structural diversity, and filtering surface runoff. Because of the unique biological attributes of SRA cover, the USFWS recommends that project proponents actively seek impact avoidance and mitigation that result in no net loss of existing SRA cover habitat value.

Coordination of Exclusion Fence and Biological Monitoring

Measure M-C-BI: For project locations where the SFPUC has multiple, concurrent, or consecutive construction projects within sensitive species habitat, the SFPUC shall develop and implement a coordinated program in the placement, installation, and monitoring of the exclusion fence (see Mitigation Measures M-BI-3b and M-BI-3c, above). At the LCSD site, the fencing shall be constructed to encompass the construction and staging areas for all projects in this area and to last through the construction periods of all proposed projects in this area, including the LCSDI, Crystal Springs Pipeline No. 2 Replacement, and Crystal Springs/San Andreas Transmission Upgrade projects. Prior to construction at the sampling station site, the exclusion fencing installed for the Pulgas Discharge Channel Modifications shall be retrofitted as needed to encompass the construction activities and staging areas for Sampling Station #5 and shall be maintained throughout the duration of the construction.

6.14 Geology and Soils

Replacement of Topsoil

Measure M-GE-2: If the SFPUC or its contractor determines that it is necessary to perform post-construction revegetation and restoration, and if the topsoil is determined to be of suitable quality, the contractor shall remove topsoil and stockpile it separately as part of site preparation and clearing for the staging areas. At the completion of construction, the contractor shall replace the topsoil in coordination with the site restoration and revegetation conducted under Mitigation Measure M-HY-3 (Preparation and Implementation of a SWPPP). Alternatively, if the topsoil is not of suitable quality, the contractor will import topsoil appropriate for site conditions as part of the restoration actions.

6.15 Hydrology and Water Quality

Preparation and Implementation of a SWPPP

Measure M-HY-3: Construction projects involving one or more acres of land disturbance would be required to obtain coverage under the NPDES General Permit for Stormwater Discharges Associated with Construction Activity. In accordance with these requirements, the SFPUC or its contractor(s) would be required to submit a Notice of Intent to the SWRCB's Division of Water Quality, develop a SWPPP, and implement site-specific BMPs to prevent discharges of non-point source pollutants in construction-related stormwater runoff into downstream storm drains and water bodies, including San Mateo Creek. The San Francisco Bay RWQCB, the primary agency responsible for protecting water quality within the project area, is responsible for reviewing and ensuring compliance with the SWPPP. This review is based on the general permit issued by the SWRCB.

The recommended BMPs, subject to the review and approval of the RWQCB, include the following measures. However, the measures themselves may be altered, supplemented, or deleted during the RWQCB's review process, since the RWQCB has final authority over the terms of the SWPPP.

a. *Scheduling*

- Schedule construction to minimize ground disturbance during the rainy season
- Sequence construction activities to minimize the amount of time that soils remain disturbed
- Stabilize all disturbed soils as soon as possible following the completion of ground-disturbing work in any area of the project site
- Provide plans to stabilize soil with vegetation or physical means in the event rainfall is expected
- Install erosion and sediment control BMPs prior to the start of any ground-disturbing activities

b. *Erosion and Sedimentation*

- Preserve existing vegetation in areas where no construction activity is planned or where construction activity will occur at a later date
- Stabilize and revegetate disturbed areas as soon as possible after construction with planting, seeding, and/or mulch (e.g., straw or hay, erosion control blankets, hydromulch, or other similar material), except in actively cultivated areas
- Install silt fences, coir rolls, and other suitable measures around the perimeter of the construction zone, staging areas, storm drains, temporary stockpiles, spoil areas, stream channels, swales, down-slope of all exposed soil areas, and other locations determined necessary to prevent offsite sedimentation
- Install temporary slope breakers during the rainy season on slopes greater than 5 percent where the base of the slope is less than 50 feet from a water body, wetland, or road crossing at spacing intervals required by the RWQCB
- Use filter fabric or other appropriate measures to prevent sediment from entering storm drain inlets
- Detain and treat stormwater and water produced by construction site dewatering using sedimentation basins, sediment traps (when water is flowing and there is sediment), baker tanks, or other measures to ensure that discharges to receiving waters meet applicable water quality objectives

c. *Reservoir Protection*

- Install fine mesh netting below the top of the dam to prevent construction materials from falling into the reservoir

d. *Groundwater/Dewatering*

- Prepare a dewatering plan prior to excavation specifying methods of collection, transport, treatment, and discharge of all water produced by construction site dewatering in compliance with the local standards and discharge permit requirements
- Impound water produced by dewatering in sediment retention basins or other holding facilities to settle the solids and provide treatment as necessary prior to discharge to receiving waters to meet San Francisco Bay Basin Plan water quality objectives
- Control discharges of water produced by dewatering to prevent erosion
- Locate sedimentation basins and other retention and treatment facilities away from waterways to prevent silt-bearing water from reaching streams

e. *Tracking Controls*

- Grade and stabilize construction site entrances and exits to prevent runoff from the site and to prevent erosion
- Take measures to prevent the loss of materials into San Mateo Creek when construction vehicles cross the site access bridge
- Install a facility at the site access to allow for tire washing when vehicles exit the site
- Remove any soil or sediment tracked off paved roads during construction by employing street sweeping

f. *In-Stream – Construction BMPs*

- Minimize disturbance of the ground surface and substrate within the ordinary high water mark of lower San Mateo Creek
- Monitor in-stream construction activity and coordinate with the contractor to identify periods when localized increases in turbidity may occur
- Prevent raw cement, concrete or concrete washings, asphalt, paint or other coatings, oil or other petroleum products, or any other substances that could be hazardous to aquatic life from contaminating the soil or entering watercourses
- Place by hand any physical barriers within lower San Mateo Creek to isolate the construction area for dewatering purposes or control of construction-related stormwater discharges (erosion and sediment control), avoiding the use of vehicles in the creek channel, and carry out the barriers under guidance of a qualified fish biologist to ensure avoidance and minimization of stress, injury, or mortality to aquatic wildlife
- Install a silt curtain or other sedimentation control measures to trap sediment and prevent sediment and silt load increases to waterways during in-stream project construction
- Keep visible oil, grease, or foam from forming on soil or water surfaces
- In the event that construction activities create a visible plume in surface waters, initiate monitoring of turbidity concentrations at the discharge site and 300 feet downstream while the visible plume persists and initiate corrective action to reduce construction-related turbidity to be in accordance with turbidity criteria specified in the Basin Plan for coldwater fish habitat beneficial use, as measured in surface waters 300 feet downstream of the working area

- Avoid operation of construction vehicles and equipment in flowing water

g. *Non-stormwater Control*

- Store all equipment, materials fuels, lubricants, solvents, and other possible contaminants outside lower San Mateo Creek's ordinary high water mark
- Place drip pans under construction vehicles and all parked equipment
- Check construction equipment for leaks regularly
- Wash construction equipment in a designated enclosed area regularly
- Contain vehicle and equipment wash water for percolation or evaporative drying away from storm drain inlets and to prevent runoff into San Mateo Creek, Crystal Springs Reservoir, and the Pulgas Discharge Channel.
- With the exception of vehicles and equipment on barges in Crystal Springs Reservoir, refuel all other vehicles and equipment at least 50 feet away from San Mateo Creek, Crystal Springs Reservoir, the Pulgas Discharge Channel, and other water bodies to minimize the risk of run-on, runoff, and spills that could affect waterbodies
- Conduct refueling in paved and curbed areas to contain any spills if this is possible; if not, refuel over drip pans or adsorptive mats
- Cover all storm drain inlets when paving or applying seals or similar materials to prevent the offsite discharge of these materials

h. *Waste Management and Hazardous Materials Pollution Control*

- Remove trash and construction debris from the project area daily
- Locate sanitary facilities a minimum of 300 feet from San Mateo Creek
- Maintain sanitary facilities regularly
- Store all hazardous materials in an area protected from rainfall and stormwater run-on and prevent the offsite discharge of leaks or spills
- Minimize the potential for contamination of Crystal Springs Reservoir, San Mateo Creek, the Pulgas Discharge Channel, and other waters by maintaining spill containment and cleanup equipment onsite, and by properly labeling and disposing of hazardous wastes
- Locate waste collection areas close to construction entrances and away from roadways, storm drains, San Mateo Creek, Crystal Springs Reservoir, and the Pulgas Discharge Channel
- Inspect dumpsters and other waste and debris containers regularly for leaks and remove and properly dispose of any hazardous materials and liquid wastes placed in these containers
- Train construction personnel in proper material delivery, handling, storage, cleanup, and disposal procedures

i. *BMP Inspection, Maintenance, and Repair*

- Inspect all BMPs regularly to confirm proper installation and function
- Inspect all stormwater BMPs daily during storms

- Inspect sediment basins, sediment traps, and other detention and treatment facilities regularly throughout the construction period
- Provide sufficient devices and materials (e.g., silt fence, coir rolls, erosion blankets, etc.) throughout project construction to enable immediate repair or replacement of failed BMPs
- Inspect all seeded areas regularly for failures, and remediate or repair immediately

j. *Permitting Monitoring and Reporting*

- Obtain and comply with RWQCB Section 401 Water Quality Certification and CDFG Streambed Alteration Agreement
- Provide the required documentation for SWPPP inspections, maintenance, and repair requirements
- Maintain written records of inspections, spills, BMP-related maintenance activities, corrective actions, and visual observations of offsite discharges of sediment or other pollutants, as required by the RWQCB
- Monitor water quality to assess the effectiveness of control measures
- Notify the RWQCB, CDFG, U.S. Fish and Wildlife Service, and National Marine Fisheries Service if the criteria for turbidity, oil/grease, or foam are exceeded and undertake corrective actions
- Notify the RWQCB, CDFG, U.S. Fish and Wildlife Service, and National Marine Fisheries Service immediately of any spill of petroleum products or other organic or earthen materials and undertake corrective action

k. *Post-construction BMPs*

- Revegetate all temporarily disturbed areas as required after construction activities are completed
- Remove any remaining construction debris and trash from the project site and area upon project completion
- Phase the removal of temporary BMPs as necessary to ensure stabilization of the site
- Maintain post-construction site conditions to avoid any unintended drainage channels, erosion, or areas of sedimentation
- Correct post-construction site conditions as necessary to comply with the SWPPP and any other pertinent RWQCB requirements

6.16 Hazards and Hazardous Materials

Conduct Investigation for Naturally Occurring Asbestos

Measure M-HZ-2a: To determine the applicability of the Asbestos ATCM, the SFPUC shall conduct a soils investigation in accordance with the California Geological Survey's Special Publication 124, *Guidelines for Investigations of Naturally Occurring Asbestos in California* (CGS, 2002). The investigation shall include:

- Review of geological, soils, and vegetation references to estimate the extent of soil or rock containing naturally occurring asbestos
- Site-specific mapping of the occurrence of soil and rock containing naturally occurring asbestos
- Use of an appropriate sampling strategy to obtain the most representative information for the proposed project
- Appropriate analytical methods for naturally occurring asbestos

The geological investigation and reporting shall be conducted by or under the direct supervision of a professional geologist, and it is preferable for mapping to be conducted by or under the direct supervision of a certified engineering geologist.

If the geological investigation finds that construction activities would not encounter rock containing greater than 0.25 percent naturally occurring asbestos, the SFPUC shall submit a copy of the report to the BAAQMD with an application for exemption from the requirements of the Asbestos ATCM. If the geologic investigation finds that construction would encounter rock containing greater than 0.25 percent naturally occurring asbestos, then the SFPUC shall implement Mitigation Measure M-HZ-2b (Asbestos Dust Mitigation Plan).

Asbestos Dust Mitigation Plan

Measure M-HZ-2b: If the investigation completed in accordance with Mitigation Measure M-HZ-2a (Conduct Investigation for Naturally Occurring Asbestos) finds that rock containing greater than 0.25 percent naturally occurring asbestos would be disturbed during construction in the LCSD vicinity, the SFPUC or its construction contractor shall submit the appropriate notification forms and prepare an asbestos dust mitigation plan specifying measures that will be taken to ensure that no visible dust crosses the work limits during construction. The plan must specify the following measures:

- Prevent and control visible track-out from the work area
- Ensure adequate wetting or covering of active storage piles
- Control disturbed surface areas and storage piles that would remain inactive for 7 days
- Control traffic on on-site unpaved roads, parking lots, and staging areas, including a maximum vehicle speed of 15 miles per hour
- Control earthmoving activities
- Control offsite transport of dust emissions that contain naturally-occurring asbestos-containing materials
- Stabilize disturbed areas following construction

The asbestos dust mitigation plan shall be submitted to and approved by the BAAQMD prior to the beginning of construction, and as provided for in the Asbestos ATCM, alternative measures that provide an equivalent level of dust control may be included in the Dust Mitigation Plan subject to BAAQMD authorization. The construction contractor(s) must ensure the implementation of all approved dust mitigation measures throughout the construction project. In addition, if required by the BAAQMD, the SFPUC or a qualified third party consultant shall conduct air monitoring for offsite migration of asbestos dust during construction activities and shall modify the dust mitigation plan on the basis of the air monitoring results if necessary.

Implement DTSC Alternative Management Standards for Treated Wood Waste

Measure M-HZ-3: The SFPUC will implement the requirements of the DTSC Alternative Management Standards for Treated Wood Waste. In accordance with these standards, employees who handle the treated wood waste or would otherwise be expected to come into contact with the waste will be trained in the applicable regulations related to the handling of treated wood waste. Because the treated wood waste will be generated incidental to normal SFPUC business operations, it will be segregated from other wastes, appropriately labeled, and transported to an authorized treated wood waste disposal facility in accordance with the alternative management standards. The treated wood waste will not be burned, scavenged, or stored in contact with the ground. The SFPUC will not store more than 1,000 pounds of treated wood waste for longer than 30 days, and will identify the treated wood waste to the disposal facility personnel upon disposal. Reuse of these stoplogs will not be allowed unless they are reused on site, or if the use is consistent with allowable reuses for the wood treatment chemicals used on the stoplogs. If the stoplogs are altered in anyway, the SFPUC or contractor will handle them in a way that prevents the uncontrolled release of hazardous constituents to the environment, and any resulting sawdust or other particles smaller than one cubic inch will be captured and managed as treated wood waste.

6.17 Mineral and Energy Resources

Because the project would not have any significant impacts associated with mineral or energy resources (see analysis in Section 5.17, Mineral and Energy Resources), no mitigation measures would be required.

6.18 Agricultural Resources

Because the project would not impact agricultural resources (see analysis in Section 5.18, Agricultural Resources), no mitigation measures would be required.

6.19 Supplemental Mitigation Measures

As described in Section 5.13, Biological Resources, implementation of Mitigation Measures M-BI-1c, M-BI-7a, M-BI-7b, M-BI-8a, and M-BI-8b could result in additional environmental impacts. In addition to application of the foregoing mitigation measures, the SFPUC would implement the following mitigation measures at individual habitat improvement mitigation sites as appropriate to further ensure site-specific impacts remain less than significant. This EIR identifies the applicability of the following supplemental mitigation measures to projects described in Table 5.13-7, but the measures could also apply to other unspecified sites as necessary to avoid significant impacts.

Historic Context and Archaeological Survey Report

Measure M-MS-CP-1: Following the SFPUC's final determination of mitigation sites, a qualified archaeologist shall conduct a reconnaissance-level survey of mitigation sites as appropriate to determine the presence of archaeological resources (e.g., Half Moon Bay/Pilarcitos, site MS-9). A Historic Context and Archaeological Survey Report (HCASR) shall be prepared in compliance with MEA's archaeological guidelines for WSIP projects. The HCASR shall be approved by MEA's Environmental Review Officer (ERO), or a designee, and shall be submitted to the Northwest Information Center.

Extended Archaeological Survey

Measure M-MS-CP-2: Following the SFPUC's final determination of mitigation sites, an Extended Archaeological Survey (EAS) shall be completed to define the boundaries of any recorded archaeological site (e.g., CA-SMA-81 located at Half Moon Bay/Pilarcitos, site MS-9).

Archaeological Evaluation Plan and Evaluation Report

Measure M-MS-CP-3: Following the SFPUC's final determination of mitigation sites, a qualified archaeologist shall prepare an Archaeological Evaluation Plan (AEP) consistent with MEA's archaeological guidelines for WSIP projects for the archaeological resources (e.g., potentially applicable to Skyline Quarry, site MS-4, and Adobe Gulch Creek South, site MS-5). The AEP shall create a program to determine the potential for the resources to meet the California Register criteria and the findings of the evaluation shall be presented in an Archaeological Evaluation and Effects Report (AEER) consistent with MEA's archaeological guidelines for WSIP projects.

If, based on the conclusions of the AEER, the ERO determines the site(s) is eligible for the California Register of Historical Resources, the site(s) should be avoided. If the project cannot avoid the site(s), an Archaeological Research Design and Treatment Plan (ARDTP) shall be prepared by the archaeologist and submitted to the ERO. The ARDTP will be prepared consistent with MEA's archaeological guidelines for WSIP projects. Once approved by the ERO, a data-recovery investigation and/or other treatment shall be conducted by the archaeologist.

Historical Resources Evaluation

Measure M-MS-CP-4: If there is evidence that a mitigation project would affect buildings or structures that appear to be older than 50 years, a Secretary of the Interior-qualified architectural historian shall record and evaluate the buildings and structures (e.g., structures at Half Moon Bay/Pilarcitos, site MS-9). A Historic Resources Survey and Evaluation Report shall be completed and submitted to MEA.

Prescribed Burn Limits

Measure M-MS-AQ-1: For mitigation projects that involve the use of prescribed burns for either construction or operations (e.g., San Andreas Reservoir, Upper San Mateo Creek, or Adobe Gulch, sites MS-2, 3, and 7, respectively), the SFPUC shall ensure that prescribed burns are limited to approximately three acres per day or an appropriate acreage to ensure that emissions rates do not exceed the Bay Area Air Quality Management District significance thresholds for criteria pollutants.

Access Road Improvements and Maintenance

Measure M-MS-GE-1: To the extent feasible, dirt access roads for mitigation sites shall be located away from steep gradients, landslide-prone areas, and areas with poor drainage. However, for mitigation projects involving construction of access roads on steeply to moderately sloped terrain (e.g., Adobe Gulch, Site MS-7), the SFPUC shall incorporate an access road improvements and maintenance plan into the project design and contractor specifications for the construction of new, permanent dirt access roads. The project design shall specify road design guidelines and maintenance requirements that would be implemented to minimize concentrated runoff and associated development of erosional channels, rills, or gullies. The project shall include a regular inspection schedule and maintenance requirements, including replacement and repairs to sediment and runoff control best management practices (BMPs), and revegetation and stabilization of eroded road cuts or fill slopes.

Geologic Investigation and Stability Analysis, Geologic Investigation and Stability Analysis

Measure M-MS-GE-2: For mitigation projects with the potential for slope stability hazards and exposure to and possible damage from landslides or liquefaction (e.g., Skyline Boulevard, Upper San Mateo Creek, and Skyline Quarry, sites MS- 1, 3, and 5, respectively), the SFPUC shall retain a qualified geotechnical engineer to conduct a site-specific geologic investigation and a slope stability analysis to identify and mitigate potential hazards. The analysis shall delineate areas of existing and potential mass movement as well as identify soils prone to liquefaction, lateral spreading, or subsidence. The geotechnical engineer shall recommend a suitable analysis, conduct the investigation, and prepare a site-specific geologic/geotechnical assessment report. These evaluations shall be analyzed in terms of the proposed changes to the site. As appropriate to each project, the SFPUC shall incorporate the recommendations identified in the site-specific geotechnical report, including appropriate construction measures and design features, and, if needed, slope stabilization measures, into the project design to minimize the potential for unstable geologic conditions during construction and operation of the habitat improvement activities. The geotechnical engineer shall provide necessary inspection and reporting throughout the project construction. The engineering remedies developed in these recommendations are not expected to incur secondary impacts on the environment, because geotechnical mitigation typically relies on accepted soil foundation stabilization measures that are common to standard engineering practice in California and implemented throughout the greater San Francisco Bay Area without secondary impacts on the environment.

Prescribed Burn Use of Best Management Practices for Protection of Water Quality

Measure M-MS-HY-1: For mitigation projects that involve the use of prescribed burns for either construction or operations (e.g., San Andreas Reservoir, Upper San Mateo Creek, or Adobe Gulch, sites MS-2, 3, and 7, respectively), the SFPUC shall include BMPs for water quality protection as part of prescribed burn planning. The SFPUC will specifically plan all prescribed burns to control erosion after the burn to prevent sediment runoff into streams, reservoirs, and wetlands, including measures, for example, to select fire line locations and consider weather, fuel, soil, and topographic conditions; to avoid intense burns that remove forest floor litter; to avoid burning piles of slash in riparian management zones; and to use natural or existing barriers (e.g., roads, streams, lakes) where possible. BMPs following a prescribed burn include using erosion control measures for fire lines that could erode soil into lakes, streams, and wetlands; revegetation; and the installation of water bars.

Environmental Site Assessment

Measure M-MS-HZ-1: For mitigation sites with the potential to encounter hazardous materials in soils or groundwater (e.g., Skyline Quarry, site MS-4, and Half Moon Bay/Pilarcitos, site MS-9), the SFPUC shall retain a qualified environmental professional to conduct the following activities:

- Update the environmental database review to identify permitted hazardous materials and environmental cases within 0.25 mile of the project area.
- Conduct soil sampling to: (1) assess concentrations of metals for which California has established hazardous waste criteria, and that were not previously analyzed for, and (2) evaluate soil and/or groundwater quality in the vicinity of any sites identified through the updated environmental database review as having the potential to affect soil or groundwater in the project area
- Prepare a report documenting the activities performed, summarizing the results, and making recommendations for appropriate handling of soil and groundwater during construction
- Prepare a contingency plan identifying measures to be taken should unanticipated contamination be identified during construction

Hazardous Building Materials Survey and Disposal Requirements

Measure M-MS-HZ-2: For any demolition of existing buildings or facilities (e.g., Skyline Quarry, site MS-4, and Half Moon Bay/Pilarcitos, site MS-9), the SFPUC will retain a registered environmental assessor or a registered engineer to perform a hazardous building materials survey for each structure prior to demolition or renovation activities. If any friable asbestos-containing materials, lead-containing materials, or hazardous components of building materials are identified, adequate abatement practices, such as containment and/or removal, will be implemented prior to demolition or renovation. Any PCB-containing equipment or fluorescent lights containing mercury vapors will also be removed and disposed of properly.

Prescribed Burn Measures

Measure M-MS-HZ-3: For mitigation projects that involve the use of prescribed burns for either construction or operations (e.g., San Andreas Reservoir, Upper San Mateo Creek, or Adobe Gulch, sites MS-2, 3, and 7, respectively), the SFPUC shall implement the following measures to reduce the risk of hazards associated with wildland fires.

> *Prescribed Burn Planning*. To manage the use of prescribed burns, the SFPUC will designate a qualified fire manager to oversee all burn operations. All prescribed burns will have a defined burn plan. The fire manager will determine what type of plan is necessary, and the plan will be subject to his/her approval. Burn plan components will include, but are not limited to, crew size and qualifications, health and safety measures, pre-burn site preparation, onsite equipment, ignition method, medical plan, contingencies, emergency contacts, smoke management, and holding, patrol, and mop-up standards.
>
> The SFPUC fire manager will ensure containment measures are developed and implemented prior to the start of prescribed fire burns. Fire control lines will be constructed around the perimeter of the area to be burned, and extra suppression resources will be made available during the burning operation. In addition, a contingency plan will be developed prior to burning to account for possible emergencies. Burning will be monitored and limited so that acceptable levels of air quality are not exceeded.
>
> The SFPUC will ensure that burns are not left unattended at any time and are monitored until they are out. Cleanup actions will be completed before the prescribed burn crews leave the defined burn area, as defined in the prescribed burn plan. The burn area will be inspected the morning following a prescribed burn. The SFPUC fire manager will make the required notifications regarding the completion of a prescribed burn.

CHAPTER 7

Other CEQA Issues

Sections	Tables
7.1 Growth-Inducing Impacts	7-1 Summary of Cumulative Impacts
7.2 Summary of Cumulative Impacts	
7.3 Significant Environmental Effects that Cannot be Avoided if the Proposed Project is Implemented	
7.4 Significant Irreversible Environmental Changes	
7.5 References	

7.1 Growth-Inducing Impacts

7.1.1 Introduction and Overview

This section describes the growth inducement potential and associated secondary effects of growth impacts of the proposed project, as required by the California Environmental Quality Act (CEQA). CEQA requires that an environmental impact report (EIR) evaluate the growth-inducing impacts of a proposed project.[1] A growth-inducing impact is defined as follows:

> [T]he ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth.... It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.

As described in Chapter 2, Section 2.2, the San Francisco Planning Department prepared a Program Environmental Impact Report (PEIR) on the SFPUC's Water System Improvement Program (WSIP), which was certified in October 2008 (San Francisco Planning Department, 2008). The PEIR includes a detailed analysis of the growth inducement potential of the overall WSIP water supply strategy and concluded that "The WSIP would support planned growth in the existing SFPUC service area (WSIP PEIR, Vol. 4, Chapter 7, Impact 7-1)."

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[1] CEQA Guidelines Section 15126.2(d).

The Lower Crystal Springs Dam Improvement (LCSDI) project, as a facility improvement project in the WSIP, would be a contributing factor in that growth inducement potential and associated indirect effects of growth. By removing the lack of a reliable water supply and supply system as one potential obstacle to growth within the SFPUC service area, the WSIP, and thus the proposed project, would have an indirect growth-inducing effect according to the CEQA definition above.[2]

This EIR tiers from the WSIP PEIR, and the growth inducement analysis contained in PEIR Chapter 7 and associated Appendix E are incorporated by reference into this EIR. All impacts related to the WSIP water supply strategy to which this project contributes have been examined at a sufficient level of detail in the PEIR and no additional analysis is necessary in this document. The significant environmental effects have been adequately addressed in the PEIR, and the SFPUC has adopted the CEQA Findings on the PEIR related to the growth inducing impacts of the WSIP. A summary of the growth inducement analysis in the PEIR is provided below.

7.1.2 Summary of PEIR Growth Inducement Analysis

Implementation of the WSIP would achieve the WSIP goals and objectives, including the water supply goal through the year 2018. It would allow the SFPUC to: (1) meet its customer water needs in nondrought periods through the year 2018 and (2) limit rationing to a maximum of 20 percent systemwide reduction in water service during extended droughts. Achieving the WSIP water supply goal would increase the reliability of water service to existing customers as well as provide water to serve planned growth of additional residential and business customers in the existing SFPUC service area.

A variety of factors influence new development or population growth in the area served by SFPUC water, including economic conditions of the region, adopted growth management policies in the affected communities, and the availability of adequate infrastructure (e.g., water service, sewer service, public schools, and roadways, etc.), with economic factors generally the lead driver. While water service is only one of many factors affecting the growth potential of a community, it is one of the chief public services needed to support urban development, and lack of a reliable water supply as well as a service capacity deficiency could constrain future development.

Pursuant to CEQA, growth *per se* is not assumed to be necessarily beneficial, detrimental, or of little significance to the environment; it is the secondary, or indirect, effects of growth that can cause adverse changes to the physical environment. The indirect effects of population and/or economic growth and accompanying development can include increased demand on community services and public service infrastructure; increased traffic and noise; degradation of air and water quality; and conversion of agricultural land and open space to urban uses. Local land use plans (e.g., general plans and specific plans) of the jurisdictions served by the SFPUC establish land use development patterns and growth policies that are intended to allow for the orderly expansion of urban development supported by adequate public services, including water supply, roadway infrastructure, sewer service, and solid waste service. Local jurisdictions conduct CEQA environmental review on their general and specific plans to assess the secondary effects of their planned growth and to identify feasible mitigation for significant, adverse effects. A project that would induce growth and is inconsistent with local land use plans and policies could indirectly cause adverse environmental impacts, as well as impacts on public services; this could occur if the local land use jurisdictions have not previously addressed these issues in the CEQA review of their land use plans and development proposals.

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[2] The WSIP would not *directly* induce growth as it does not involve the development of new housing to attract additional population, nor would it indirectly induce growth by establishing substantial permanent or even short-term construction employment opportunities that could stimulate population growth. Construction of the WSIP projects is not expected to involve employment opportunities substantially beyond what would normally be available to construction workers in the area, and workers are expected to be drawn from the local labor pool.

By removing the lack of a reliable water supply and water system (as one potential obstacle to growth within the SFPUC service area) and providing and assisting in the development of additional water supply sources (such as recycled water and groundwater projects as well as promotion of more efficient use of water through conservation measures), the WSIP would have an indirect growth-inducing effect according to the CEQA definition. The WSIP would support growth in the SFPUC service area through 2018, although it appears that some growth would occur irrespective of the WSIP due to increased water delivery efficiencies (e.g., plumbing code changes), conservation, and other water supply sources. Growth would in turn result in indirect effects. In most cases, the effects of population and employment growth have been identified and addressed in the EIRs for the general plans and associated area plans and specific plans adopted by the jurisdictions in the service area. Some of the identified indirect effects of growth are significant and unavoidable; others are significant but can be mitigated.

Potentially significant and unavoidable impacts as a result of growth in the SFPUC service area have been identified by the local jurisdictions in the following areas: traffic congestion, air pollution, traffic noise, construction noise, increased demand for public schools and other public services, loss of recreational opportunities and impacts on visual quality resulting from the loss of open space, cumulative effects on over-utilized parks, loss of wildlife habitat and wetlands and impacts on other biological resources, cumulative impacts on cultural resources, increased flooding potential, increased urban runoff pollutants, seismic hazards, induced population growth, failure to meet housing demand for projected population growth, exposure of new development to contaminated soil or groundwater, insufficient water supply, insufficient wastewater disposal capacity, loss of agricultural resources, land use conflicts, conflicts with existing land use plans or policies, and changes in density, scale, and character of an area.

The adopted WSIP would have growth-inducement potential through 2018 because the SFPUC (with the cooperation of the wholesale customers) would provide the additional water supply to meet purchase requests through 2018. The WSIP would support much of the growth through 2018 in the jurisdictions served by the SFPUC regional water system. In general, development that was planned and approved through the general plan process in the SFPUC service area would have environmental impacts. The environmental consequences of this planned growth have been largely addressed in local plans and the associated CEQA review as well as in other, project-specific documentation. In a number of jurisdictions, negative declarations or mitigated negative declarations were prepared for general plans and related planning documents that were found not to have significant environmental effects.

The PEIR does not identify any mitigation measures for implementation by the SFPUC that could substantially decrease or eliminate growth-inducing impacts. This is because the SFPUC does not have control over the decisions that each local agency will make with respect to growth in their jurisdictions. Individual agencies' general plans and environmental documents contain actions, limitations, and mitigation measures that will be implemented in the individual jurisdictions with local development project or program approvals. These types of mitigation measures were identified in the PEIR (see PEIR Chapter 7 and PEIR Appendix E, which are incorporated by reference into this EIR).

To assess the growth inducement potential of the WSIP and characterize the secondary effects of growth, the PEIR investigates the following questions:

- *What assumptions did the SFPUC and its wholesale customers make regarding growth (population and employment) in projecting future (2030) total water demand and customer purchases from the SFPUC?*
- *Are these assumptions consistent with forecasts prepared and used by local and regional planning agencies (e.g., Association of Bay Area Governments [ABAG], counties and cities) within the service area? What are the growth trends in the Bay Area region?*
- *Are there any notable inconsistencies between the population and employment forecasts used by the SFPUC and the wholesale customers and those of the local and regional planning agencies that suggest that the water supply planning efforts are inconsistent with land use planning efforts?*
- *Is the level of growth projected for 2030 consistent with that identified and planned for in existing adopted general plans?*
- *What are the potential environmental impacts (secondary effects) associated with growth projected to occur in the service area? Have these impacts been evaluated in previous CEQA review documents on existing general and specific plans?*
- *What mitigation measures and findings have the local jurisdictions adopted as part of approving their future growth plans?*

The issues raised in these questions are summarized below and addressed in detail in PEIR Chapter 7 (Vol. 4) and supplemented by PEIR Appendix E (Vol. 5).

- SFPUC Projections (Section 7.2). Accurate demand projections are important in ensuring that future water supplies will be adequate while not surpassing the needs of planned growth. SFPUC and its customers used computer models to forecast future water demand. Section 7.2 presents an overview of the SFPUC water service area, and describes key factors (assumptions, inputs, and methodologies) used in estimating future demand that relate to growth and inform comparisons between water demand and land use planning projections. These factors include baseline population, methodology used to determine existing water usage by land use/account type, the current water supply agreement between the SFPUC and its wholesale customers, and assumptions regarding future land use patterns, water conservation and recycling, and water from other (non-SFPUC) sources through 2030. The demand estimates, in conjunction with estimates of savings from conservation and use of other water sources, provide the basis for the 2030 purchase estimates.

- *Growth Inducement Potential (PEIR Section 7.3)*. This section analyzes the WSIP's growth inducement potential: whether the demand to be met by the WSIP would be consistent with local plans and policies or could contribute to growth in the service area beyond that called for in the existing general plan. To gauge the consistency of the WSIP with growth planned in the jurisdictions served by the SFPUC, the analysis compares the growth assumed in the SFPUC projections with growth forecasts (a) developed by ABAG and (b) reflected in adopted land use plans in the service area. With respect to ABAG, this section also describes ABAG's changing expectations about growth as reflected in its updated projections issued in 2002, 2003, and 2005.

- *Indirect Effects of Growth (PEIR Section 7.4)*. Growth (whether planned or unplanned) can cause environmental impacts. Section 7.4 describes the potential impacts of growth that could be supported, in part, by implementation of the WSIP. This section also identifies measures adopted to reduce, eliminate or otherwise mitigate the impacts of planned growth.

7.1.3 Summary of Conclusions

A review of historical growth trends of a selection of jurisdictions in the service area, based primarily on information in general plans and Bay Area Water Supply and Conservation Association profiles, shows that:

- Cities in the service area are largely urbanized, most having experienced their most rapid growth in the postwar decades through the 1970s.

- Milpitas and East Palo Alto have experienced high rates of growth more recently.

- San Francisco's population fluctuated somewhat but on average has been essentially stable over the past 50 years.

- Many jurisdictions cannot grow laterally and their general plans include policies to manage growth; many general plans identify strategies consistent with "smart growth" principles, such as encouraging infill development and the redevelopment of previously developed areas, as means to accommodate future growth.

- The SFPUC's wholesale customers vary widely, in a variety of ways: by size, overall demand projected for 2030, the change that the 2030 demand represents in absolute terms and as a percentage of 2001 demand, and the degree to which the customers depend on the SFPUC for their water supply. As such, the WSIP would remove growth obstacles to varying degrees within the service area.

As stated above, the complete growth inducement analysis is included in PEIR Chapter 7 and PEIR Appendix E, which are incorporated into this EIR by reference.

7.1.4 Indirect Effects of Growth

The indirect effects of growth expected in the general plans of jurisdictions in the service area have been identified in the EIRs prepared for those plans. Impacts commonly identified as significant and unavoidable and those commonly identified as significant but mitigable are presented in PEIR Section 7.4 and summarized briefly below.

- The most commonly identified significant and unavoidable impacts of growth are:
  - Increased traffic congestion
  - Deterioration of air quality
  - Cumulative effects of increased air pollutant emissions and noise
- Mitigation measures have been adopted by local jurisdictions as part of their general plan approval processes to address the secondary effects of planned growth. These measures are summarized in PEIR Appendix E.
- Two cities identified increased demand for potable water supply as a significant and unavoidable effect of growth; the WSIP would address this issue in those two cities.
- Overriding considerations commonly adopted by the decision-making bodies in adopting their general plans include the following:
  - Accommodation of growth in an orderly, fiscally sound manner
  - Economic diversification and job generation
  - Creation of housing, furtherance of regional housing share objectives, and provision of affordable housing
  - Improvements of the local jobs/housing balance
  - Increased sales revenue and positive fiscal impact
  - Promotion of alternative modes of travel to reduce reliance on private vehicles
  - Establishment of policies to preserve natural areas and open space lands
- For many cities that receive water from the SFPUC regional system, the supply to be provided under the WSIP supports and is consistent with the planned growth reflected in their existing adopted general plans. For other communities, it appears that the WSIP supply (in combination with other supply sources available to those communities), could serve a level of growth beyond that identified in the existing general plans. In those cases, secondary effects of such growth could include impacts related to increased density and impacts related to development of new land areas.
  - Density related impacts could include, e.g., increased traffic congestion, air pollution, traffic noise, construction noise, and demand on public services.
  - Land area related impacts could include, e.g., loss of open space and agricultural land, loss of and degradation of water quality due to increases in impervious surface area.

As described above, the LCSDI project is one of the facility improvement projects of the WSIP and therefore, its implementation would contribute to the growth inducement potential of the WSIP and the associated indirect effects of growth. Implementation of the LCSDI project would thus contribute to an incremental portion of the growth inducement impacts and associated indirect impacts of growth of the WSIP. See Chapter 7 of the PEIR for a detailed analysis of the WSIP's growth inducement effects (San Francisco Planning Department, 2008).

7.2 Summary of Cumulative Impacts

As described in Chapter 5, Section 5.1.4, Cumulative Impacts, cumulative impacts result from two or more individual effects that, when considered together, are considerable or that compound or increase other environmental impacts (CEQA Guidelines, Section 15355). The cumulative impacts from several projects are the change in the environment that results from the incremental impact of the project when added to other closely related past, present, or reasonably foreseeable future projects. The cumulative analysis in this EIR identifies project impacts that would be individually limited, but when viewed in connection with the effects of other past, present, and probable future projects, could be "cumulatively considerable" (i.e., significant) with regard to the project's contribution to a cumulative impact.

In Chapter 5, cumulative impacts are discussed and analyzed under each resource area immediately following the description of the direct impacts of the project and the identified mitigation measures for that resource area. The analyses of cumulative impacts are based on the same setting, regulatory framework, and significance criteria as the direct impacts, and it applies the results of the project-level, direct impact analysis within the context of the identified geographic scope of area affected by the cumulative effect. Table 5.1-1 lists the relevant past, present, or reasonably foreseeable future projects proposed by the SFPUC and other jurisdictions that are considered in the cumulative impact analysis. Figures 5.1-1 and 5.1-2 show the cumulative project locations and construction schedules of these projects, respectively.

Table 7-1, below, provides a summary of all of the cumulative impacts associated with the Lower Crystal Springs Dam (LCSD) site. With two exceptions, all cumulative impacts at the Sampling Station #5 site were determined to be less than significant; cumulative impacts associated with terrestrial biological resources at this site would be potentially significant, and cumulative impacts associated with construction-related air quality emissions would be considered significant and unavoidable under the proposed Bay Area Air Quality Management District's guidelines. The reader is referred to Chapter 5 for the detailed discussion of cumulative impacts by resource topics, and where appropriate, a description of mitigation measures identified to avoid or lessen the cumulative impacts.

7.3 Significant Environmental Effects that Cannot be Avoided if the Proposed Project is Implemented

In accordance with Section 21067 of CEQA, and with Sections 15126(b) and 15126.2(b) of the CEQA Guidelines, the purpose of this section is to identify project-related environmental impacts that could not be eliminated or reduced to a less-than-significant level with implementation of all identified mitigation measures. The findings in this chapter are subject to final determination by the San Francisco Planning Commission as part of its certification of this EIR.

TABLE 7-1
SUMMARY OF CUMULATIVE IMPACTS

Cumulative Impact[a]	Significance Determination
Impact C-LU: Cumulative disruption of established communities and changes in existing land use patterns.	LS
Impact C-AE: Cumulative impacts on scenic resources (vistas, roadways, and designated scenic areas) or the visual character of the sit and its surroundings.	LS
Impact C-CP: Cumulative impacts on cultural resources.	SU
Impact C-PH: Cumulative impacts on population and housing.	N/A
Impact C-TR: Cumulative traffic increases on local and regional roads.	PSM
Impact C-NO: Cumulative increases in construction noise in the LCSD vicinity and along construction haul and delivery routes.	PSU
Impact C-AQ: Cumulative air quality impacts	LS/SU[b]
Impact C-WS: Cumulative impacts on wind and shadow.	N/A
Impact C-RE: Cumulative effects on recreational resources during construction.	SU
Impact C-UT: Cumulative effects on utilities and service systems.	N/A
Impact C-PS: Cumulative impacts on public services.	N/A
Impact C-BI: Cumulative loss of sensitive biological resources during construction and operation	PSM
Impact C2-BI: Cumulative impacts on fisheries.	LS
Impact C-GE: Cumulative impacts on geology, soils, and seismicity.	LS
Impact C-HY: Cumulative impacts on water quality and hydrology.	LS
Impact C-HZ: Cumulative impacts related to hazards and hazardous materials.	LS
Impact C-ME: Cumulative impacts on energy use.	LS
Impact C-AG: Cumulative impacts on agricultural resources.	N/A

B = Beneficial impact
N/A = Not Applicable or no impact
LS = Less than Significant impact, no mitigation required
SM = Significant impact, can be Mitigated to less than significant
PSM = Potentially Significant impact, can be Mitigated to less than significant
SU = Significant Unavoidable impact
PSU = Potentially Significant Unavoidable impact

[a] All cumulative impacts apply only to the LCSD site, with the exception of Impacts C-AQ and C-BI which also apply to the Sampling Station #5 site. All other cumulative impacts at the Sampling Station #5 site are less than significant.

[b] For all Air Quality impacts, two significance determinations are provided. The first determination is based on evaluation with the adopted 1999 BAAQMD guidelines and the second is based on the evaluation with the proposed 2009 BAAQMD CEQA Air Quality Guidelines.

7.3.1 Significant and Unavoidable, and Potentially Significant and Unavoidable Effects of the Proposed Project

This section identifies project impacts that, even with the implementation of all identified mitigation measures, would remain potentially significant or significant, and are therefore considered *unavoidable*. Chapter 5, Environmental Setting, Impacts, and Mitigation Measures, describes the potential environmental impacts of the proposed project and identifies mitigation measures to reduce impacts determined to be potentially significant or significant. Several potentially significant/significant and unavoidable impacts were identified, and listed below, which would result from project implementation, including temporary impacts due to construction activities and permanent impacts due to alteration of historic resources. With the exception of the impacts listed below, all other project impacts would either be no impact, less than significant, or reduced to less-than-significant levels by implementation of the identified mitigations measures.

- Potentially significant and unavoidable long-term visual impacts due to the proposed changes in reservoir operations and associated changes in water surface elevations, which would inundate shoreline woodlands and result in the death of trees within the inundation zone around the reservoir. To the extent feasible, this impact would be reduced to a less-than-significant level through implementation of Mitigation Measure M-AE-4 (Tree Removal Plan). Even with implementation of Mitigation Measure M-AE-4, however, the SFPUC would not be able to remove dead or dying trees at locations where there could be significant adverse impacts on special-status species, sensitive habitats, and in locations that are not reasonably accessible. To the extent that the Tree Removal Plan may prove infeasible in some locations where significant aesthetic impacts occur, the LCSDI project could result in a potentially significant and unavoidable aesthetic impact (see Section 5.3, Impact AE-4).

- Significant and unavoidable impacts on historic resources would result from the proposed modifications to the Lower Crystal Springs Dam (LCSD), a historic resource. Although preparation of Historic American Engineering Record (HAER) documentation in accordance with the National Historic Preservation Act of 1966 would reduce impacts on historic resources, this impact would remain significant and unavoidable (see Section 5.5, Impact CP-1 and Mitigation Measures M-CP-1a and M-CP-1b).

- Significant and unavoidable cumulative impacts on historic architectural resources would result from the modifications to the LCSD (a historic resource) proposed by the LCSDI project in combination with the alterations to Crystal Springs Outlet Structure 1 (OS-1) (a contributing element to the LCSD) proposed by the Crystal Springs/San Andreas (CSSA) Transmission Upgrade project. The LCSDI project's contribution to this impact would remain cumulatively considerable (i.e., significant), even with the implementation of the HAER recordation and public interpretation mitigation measures presented in the project-level EIRs for these two projects (see Section 5.5, Impact C-CP).

- Significant and unavoidable noise impacts would result during both daytime and nighttime construction activities in the vicinity of the LCSD site because construction-related noise levels at nearby residential receptors would exceed sleep and speech interference thresholds, even with preparation and implementation of a site-specific noise control plan by qualified noise consultant (see Section 5.7, Impact NO-1 and Mitigation Measure M-NO-1).

- Significant and unavoidable noise impacts would result from nighttime construction-related traffic noise along Polhemus Road, a designated haul route. Nighttime haul truck volumes associated with project construction activities would generate noise levels exceeding the sleep interference threshold at the closest residential receptors along Polhemus Road, and there is no feasible mitigation measure (see Section 5.7, Impact NO-3).

- Potentially significant and unavoidable cumulative noise impacts could occur because the LCSDI project would cumulatively contribute to combined and prolonged noise disturbance in the LCSD site vicinity. As a result of multiple projects being constructed in the same vicinity with close and/or concurrent construction schedules, residents in the vicinity would be subject to construction noise for approximately four years (2010 through 2014), including periods of nighttime construction. Speech interference thresholds at the closest residential receptors to the LCSD site could be exceeded during daytime construction activities, and sleep interference thresholds could be exceeded during nighttime construction activities. The LCSDI project would also contribute to cumulative nighttime noise increases along Polhemus Road, a designated construction haul route, regardless of the extent of cumulative nighttime increases along this road associated with other cumulative projects because the LCSDI project alone would already exceed the sleep interference threshold at the closest residential receptors. Even with implementation of administrative and source controls (Mitigation Measure M-NO-1), and preparation and implementation of a coordinated noise control plan (Mitigation Measure M-C-NO), cumulative noise impacts could still exceed the thresholds. Thus, the proposed project's contribution to this cumulative impact would be potentially significant and unavoidable (see Section 5.7, Impact C-NO).

- Significant and unavoidable air quality impacts would result from construction-related emissions of engine exhaust (CO and ozone precursors) when evaluated under the proposed BAAQMD CEQA Guidelines (expected to be adopted in early 2010). Even with implementation of available mitigation measures (Mitigation Measures M-AQ-1b and M-AQ-1c), the project's construction emissions would exceed the proposed BAAQMD significance threshold for an ozone precursor (NOx). However, under the BAAQMD's adopted guidelines (1999), the project's equipment exhaust emissions are considered potentially significant, but would be mitigated to a less-than-significant level with implementation of BAAQMD-recommended exhaust control measures (Mitigation Measure M-AQ-1b) (see Section 5.8, Impact AQ-1).

- Under the BAAQMD's proposed significance threshold for NOx, significant and unavoidable cumulative impacts associated with construction-related air quality would occur because the project would cumulatively contribute to the region's nonattainment status for ozone. Although implementation of Mitigation Measure M-AQ-1b (Exhaust Control Measures) and M-AQ-1c (Additional Exhaust Control Measures) would help to reduce the project's individual contribution to NOx emissions, even at the project level, these emissions would remain significant and unavoidable. However, under the adopted 1999 BAAQMD guidelines, the LCSDI project's incremental contribution to nonattainment of ozone and suspended particulates would be reduced to a less-than-significant level with implementation of dust and exhaust control measures (Mitigation Measures M-AQ-1a and M-AQ-1b); therefore, the LCSDI project's contribution to cumulative air quality impacts related to emissions of ozone, PM_{10}, and $PM_{2.5}$ would not be cumulatively considerable and would be less than significant (see Section 5.8, Impact C-AQ).

- Significant and unavoidable cumulative impacts on recreational resources would occur as a result of the combined and prolonged construction activities from multiple projects in the

LCSD vicinity. The LCSDI project's contribution to the combined effects of the Skyline Boulevard and LCSD vista point closures, and construction-related traffic, air, and noise impacts on established recreational uses in the project area would be a cumulatively significant impact. While implementation of Mitigation Measures M-TR-1 (Traffic Control Plan), M-C-TR (Coordinated Peninsula Regional Transportation Management Plan), M-RE-1 (Notify Bicycle Organizations of Detours), M-AQ-1a (Dust Control Measures), M-AQ-1b (Exhaust Control Measures), M-AQ-1c (Additional Exhaust Control Measures), M-NO-1 (Administrative and Source Controls), and M-C-RE (Coordinate Trail Access for Sawyer Camp Trail during Construction) would reduce the project's contribution to significant cumulative recreation impacts, it would not address the project's contribution to the cumulative four-year duration of construction impacts. The cumulative four-year duration of construction impacts would affect the quality of the recreational experience along bicycle routes, and the project's contribution to that impact would remain cumulatively considerable. Therefore, the cumulative impact on the recreational resources would be significant and unavoidable (see Section 5.10, Impact C-RE).

7.3.2 Significant and Unavoidable Effects of the WSIP

The proposed project is one of the facility improvement projects that comprise the SFPUC's WSIP. Insofar as the proposed project is a component of the WSIP, it would contribute to the WSIP's significant and unavoidable, and potentially significant and unavoidable growth inducement and water supply impacts, as identified in the WSIP PEIR (San Francisco Planning Department, 2008) and summarized below:

- By providing water to support planned growth in the SFPUC service area, the WSIP will result in significant and unavoidable growth inducement effects that are primarily related to secondary effects such as air quality, traffic congestion, and water quality. These impacts were adequately addressed in the PEIR at a sufficient level of detail such that no further analysis is required in this EIR. The analysis contained in the PEIR is incorporated into this EIR by this reference (see PEIR Chapter 7).

- Based on the best available information at that time, the PEIR made the conservative determination that the WSIP would result in a potentially significant and unavoidable impact on fishery resources in Crystal Springs Reservoir related to inundation of spawning habitat upstream of the reservoir (see PEIR Chapter 5, Section 5.5.5, Impact 5.5.5-1). The project-level fisheries analysis in this EIR modifies certain PEIR impact determinations based upon more detailed site-specific data and analysis. Project-level conclusions supersede any contrary impact conclusions in the PEIR. Project-level review of updated, site-specific information that was developed following certification of the PEIR has been incorporated into this EIR, and the project-level analysis has determined that impacts on fishery resources due to inundation effects would be less than significant (see Chapter 5, Section 5.13, Impact BI-15).

- Based on the best available information at that time, the PEIR made the conservative determination that the WSIP would result in a significant and unavoidable impact related to flow along Alameda Creek below the Alameda Creek Diversion Dam ("Alameda Creek Hydrologic Impact") (see PEIR Chapter 4, Section 5.4.1, Impact 5.4.1-2). The project-level analysis conducted for the Draft EIR on the Calaveras Dam Replacement Project, published in October 2009 (San Francisco Planning Department, 2009), determined this impact to be less than significant based upon more detailed site-specific data (see Calaveras Dam

Replacement Project Draft EIR Chapter 4, Section 4.6, Impact 4.6.5). To be conservative, this EIR assumes the PEIR's significant and unavoidable impact determination for the PEIR's Alameda Creek Hydrologic Impact (PEIR Impact 5.4.1-2). The lead agency, however, will update this EIR to be consistent with the Calaveras Dam Replacement Protect Final EIR if the Calaveras document is certified prior to finalizing this EIR. Certification of the Calaveras Dam Replacement Project EIR is scheduled for July 2010.

7.4 Significant Irreversible Environmental Changes

In accordance with CEQA Section 21100(b)(2)(B) and CEQA Guidelines Sections 15126(c) and 15126.2(c), the purpose of this section is to identify significant irreversible environmental changes that would be caused by the proposed project. Because the proposed project would consist of modification to existing facilities, there would be no irretrievable or irreversible commitment of land. However, construction activities associated with the proposed improvements to LCSD and Sampling Station #5 would result in an irretrievable and irreversible commitment of natural resources through the use of power supply and construction materials.

The proposed project would require the commitment of energy resources to fuel and maintain construction equipment (such as gasoline, diesel, and oil) during the construction period. Project construction would commit resources, such as concrete, to be used for the proposed improvements to the dam and stilling basin, as well as other related improvements. The proposed project would also commit asphalt materials for paved surfaces disturbed during project construction. However, as described in Chapter 3, Project Description, some of the concrete generated during demolition activities would be reused or recovered. It should be noted that the long term commitment of structural resources required for implementation of the proposed project would contribute to improving the overall reliability of the regional water system by prolonging and maximizing the functionality of existing facilities and resources. It would also serve to benefit the 2.4 million people and associated commitment of existing resources in the Bay Area that are within the SFPUC service area.

Implementation of the proposed project would not result in an increased demand for energy use during operations of the proposed project; thus, no significant irreversible changes associated with long-term energy use would result.

7.5 References

San Francisco Planning Department, *Final Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program,* File No. 2005.0159E, State Clearinghouse No. 2005092026. Certified October 30, 2008.

San Francisco Planning Department, *Draft Environmental Impact Report for the San Francisco Public Utilities Commission's Calaveras Dam Replacement Project,* File No. 2005.0161E, State Clearinghouse No. 2005102102. October 6, 2009.

CHAPTER 8

Alternatives

Sections

8.1 Introduction
8.2 WSIP Alternatives
8.3 LCSDI Alternatives Analysis
8.4 Comparison of Alternatives
8.5 Alternatives Identification
8.6 Alternatives Considered but Rejected from Further Consideration
8.7 References

Table

8-1 Comparison of the Significant Environmental Impacts of the CEQA Alternatives

8.1 Introduction

The California Environmental Quality Act (CEQA) Guidelines, Section 15126.6(a), state that an environmental impact report (EIR) must describe and evaluate a reasonable range of alternatives to the proposed project that would feasibly attain most of the project's basic objectives, but that would avoid or substantially lessen any identified significant adverse environmental effects of the project. An EIR is not required to consider every conceivable alternative to a proposed project. Rather, it must consider a reasonable range of potentially feasible alternatives that will foster informed decision-making and public participation.

CEQA Guidelines Section 15126.6(e) states that, "The specific alternative of 'no project' shall also be evaluated along with its impact." The EIR must evaluate the comparative merits of the alternatives and include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the proposed project. Specifically, the CEQA Guidelines set forth the following criteria for selecting and evaluating alternatives:

- [T]he discussion of alternatives shall focus on alternatives to the project or its location which are capable of avoiding or substantially lessening any significant effects of the project, even if these alternatives would impede to some degree the attainment of the project objectives, or would be more costly. (Section 15126.6[b])

- The range of potential alternatives shall include those that could feasibly accomplish most of the basic objectives of the project and could avoid or substantially lessen one or more of the significant effects. (Section 15126.6[c])

- The specific alternative of "no project" shall also be evaluated along with its impact. (Section 15126.6[e][1])
- The alternatives shall be limited to ones that would avoid or substantially lessen any of the significant effects of the project. Of those alternatives, the EIR need examine in detail only the ones that the lead agency determines could feasibly attain most of the basic objectives of the project. The range of feasible alternatives shall be selected and discussed in a manner to foster meaningful public participation and informed decision-making. (Section 15126.6[f])

This chapter presents the CEQA alternatives analysis for the Lower Crystal Springs Dam Improvements (LCSDI) project. It presents the project objectives and impacts, discusses the methodology used to identify and screen alternatives, and presents the detailed analysis and comparison of selected alternatives. The project alternatives identified in this chapter include the potentially feasible alternatives that were selected for detailed analysis as well as those that were considered but rejected from further analysis. For the selected alternatives, this analysis evaluates the alternatives' impacts against existing environmental conditions and compares the potential impacts of the alternatives against those of the proposed project. This chapter also identifies the environmentally superior alternative.

Following this introduction, Section 8.2 briefly describes the systemwide, programmatic alternatives that were analyzed for the San Francisco Public Utilities Commission's (SFPUC) Water System Improvement Program (WSIP) in order to provide context for the alternatives to the LCSDI project, which is one of the key facility improvement projects included in the WSIP. Section 8.3 presents the approach and methodology of the LCSDI alternatives analysis as well as a detailed evaluation of the selected alternatives, and Section 8.4 compares the selected alternatives and identifies the environmentally superior alternative. Section 8.5 provides further background on the alternatives identification and screening process, and Section 8.6 discusses specific alternatives that were considered but rejected from further consideration.

8.2 WSIP Alternatives

As discussed in Chapter 2, Introduction and Background, of this EIR, the SFPUC approved the Phased WSIP in October 2008. The WSIP is a comprehensive program to improve the reliability of the SFPUC's regional water system with respect to water quality, seismic response, and water delivery based on a planning horizon through the year 2030, and to improve the system with respect to water supply to meet water delivery needs in the service area through the year 2018. It includes a series of facility improvement projects, including the LCSDI project. To the extent that the LCSDI project would contribute to achieving the goals and objectives of the WSIP, the analysis of the WSIP alternatives relates to the alternatives analysis of the LCSDI project.

The San Francisco Planning Department considered systemwide alternatives to the WSIP in the Program Environmental Impact Report (PEIR), which was certified by the San Francisco Planning Commission on October 30, 2008 (San Francisco Planning Department, 2008). The PEIR evaluated seven alternatives to the WSIP because of their apparent ability to meet most of the WSIP's goals, their ability to reduce one or more of the significant impacts associated with program implementation, their potential feasibility, and their collective ability to provide a reasonable range of alternatives to foster informed decision-making and public participation. Analysis of the No Program Alternative was included as required by CEQA.

The adopted WSIP incorporates elements of three alternatives to the originally proposed WSIP: the No Purchase Request Alternative, the Aggressive Conservation/Water Recycling and Groundwater Alternative, and the Modified WSIP Alternative (see SFPUC Resolution 08-200). Chapters 9 and 14 of the PEIR include more detailed descriptions of these WSIP alternatives, and also present the associated program-level environmental analysis of these alternatives. Chapter 13 of the PEIR includes additional information about the adopted Phased WSIP. All three of these chapters are incorporated into this EIR by reference (San Francisco Planning Department, 2008). For informational purposes, the alternatives to the WSIP examined in the PEIR are summarized below.

- **No Program Alternative.** Under the No Program Alternative, the SFPUC would implement only those facility improvement projects driven by regulatory requirements (which include the LCSDI project) or existing agreements with regulatory agencies. It would meet the water quality goals of the WSIP but would fail to meet the other goals and objectives. It would endeavor to meet increasing customer purchase requests through the year 2030 by diverting additional Tuolumne River water only when available under City and County of San Francisco's (CCSF's) existing water rights.

- **No Purchase Request Increase Alternative.** Under the No Purchase Request Increase Alternative, the SFPUC would implement all of the proposed WSIP facility improvement projects but would serve wholesale customers only the amount of water required under the existing Master Water Sales Agreement between the CCSF and each of the wholesale customers.

- **Aggressive Conservation/Water Recycling and Local Groundwater Alternative.** Under the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, the SFPUC would implement all of the WSIP facility improvement projects, but would endeavor to serve the projected increase in customer purchase requests through 2030 only through additional conservation, water recycling, and local groundwater projects.

- **Lower Tuolumne River Diversion Alternative.** Under the Lower Tuolumne River Diversion Alternative, the SFPUC would implement all of the WSIP facility improvement projects and would serve the projected increase in customer purchase requests through 2030 through diversions from the lower Tuolumne River near its confluence with the San Joaquin River. This alternative would include construction and operation of additional conveyance and treatment facilities to divert, transport, treat, and blend the new supply into the regional water system.

- **Year-round Desalination at Oceanside Alternative.** Under the Year-round Desalination at Oceanside Alternative, the SFPUC would implement all of the WSIP facility improvement projects and would construct a 25-million-gallon-per-day (mgd) desalination plant in San Francisco to serve the projected increase in customer purchase requests through 2030.

- **Regional Desalination for Drought Alternative.** Under the Regional Desalination for Drought Alternative, the SFPUC would implement all of the WSIP facility improvement projects and would partner with other Bay Area water agencies to construct and operate a regional desalination plant that would provide the SFPUC with supplemental supply during drought years.

- **Modified WSIP Alternative**. Under the Modified WSIP Alternative, the SFPUC would implement all of the WSIP facility improvement projects, but would modify proposed system operations to minimize environmental effects. This alternative would include the implementation of key mitigation measures identified in the PEIR.

The alternatives analysis in the PEIR identified the Modified WSIP Alternative as the environmentally superior alternative. As described above, the Phased WSIP that was ultimately adopted by the SFPUC incorporates elements of the No Purchase Request Alternative, the Aggressive Conservation/Water Recycling and Groundwater Alternative, and the Modified WSIP Alternative.

8.3 LCSDI Alternatives Analysis

In accordance with CEQA, an alternatives analysis must meet the following three criteria: (1) the alternative would attain *most* of a project's basic objectives; (2) the alternative would *avoid or substantially lessen* the significant environmental impacts of the proposed project; and (3) the alternative must be *feasible*. An EIR need not consider an alternative whose impact cannot be reasonably ascertained and whose implementation is remote and speculative. Furthermore, an EIR need not consider every conceivable alternative, but must consider a reasonable range of alternatives that will foster informed decision-making and public participation.

In an effort to develop a reasonable range of alternatives, this section first presents the project objectives (from Chapter 3, Project Description) and then summarizes the significant environmental impacts of the LCSDI project that were identified in Chapter 5, Environmental Setting, Impacts, and Mitigation Measures. The alternative approaches and strategies that would substantially lessen or avoid significant impacts are described, and then the feasibility of an alternative's strategies and its ability to meet project objectives are discussed.

8.3.1 Project Objectives

The LCSDI project objectives are to:

- Complete modifications to existing Lower Crystal Springs Dam (LCSD) facilities in compliance with the Division of Safety of Dams (DSOD) directive

- Restore the historical storage capacity of Crystal Springs Reservoir

- Improve the SFPUC's water supply delivery capability

- Help meet the SFPUC's dry-year delivery needs

- Facilitate planned shutdown of individual facilities for regular maintenance without interrupting customer service
- Maximize capture of local runoff from the Peninsula watershed
- Increase water storage on the Peninsula

The LCSDI project objectives support the goals and objectives of the WSIP (SFPUC Resolution No. 08-200). Specifically, the above-listed project-specific objectives relate directly to the following WSIP goals and objectives:

- *Seismic reliability*. Deliver basic service to the three regions in the service area within 24 hours after a major earthquake and restore facilities to meet average-day demand within 30 days after a major earthquake.
- *Delivery reliability*. Provide operational flexibility to allow planned maintenance shutdown of individual facilities without interrupting customer service; provide operational flexibility to minimize the risk of service interruption from unplanned facility upsets or outages; provide operational flexibility and system capacity to replenish local reservoirs as needed; meet the estimated average annual demand under the conditions of one planned shutdown of a major facility for maintenance concurrent with one unplanned facility outage.
- *Water supply reliability*. Meet dry-year delivery needs while limiting rationing to a maximum 20 percent systemwide reduction in water service during extended droughts.

The proposed improvements would permanently raise the level of the spillway to the historical maximum level, and implementation of the project would allow the SFPUC to increase the average and maximum water surface elevations in Crystal Springs Reservoir, thereby increasing water supply storage over existing conditions. This increase in local storage on the Peninsula would improve the SFPUC's ability to deliver water to its customers, particularly those in San Francisco and San Mateo Counties, during both drought and nondrought periods.

Implementation of the proposed project is a fundamental component needed to achieve the established WSIP system performance objectives for seismic reliability, delivery reliability, and water supply reliability listed above. The WSIP system objectives address the needs of the regional water supply system as a whole, and the LCSDI project, in combination with other facility improvement projects identified in the WSIP, is needed to fully meet these WSIP goals and objectives. The proposed project was designed to incorporate the minimum performance standards for Crystal Springs Reservoir required to achieve the WSIP systemwide level of service objectives.

8.3.2 Significant Environmental Impacts

As stated in the CEQA Guidelines, alternatives to a project must substantially lessen or avoid any of the significant environmental impacts associated with the project. The following section summarizes the significant impacts of the LCSDI project, organized by category of impact (i.e., construction, operational, or design impacts); these significant project impacts were evaluated to facilitate the development of alternative strategies and approaches. Under each category, there are two groups of significant impacts: (1) potentially significant and significant impacts that cannot be reduced to a less-than-significant level through the implementation of mitigation measures (potentially significant and unavoidable [PSU] and significant and unavoidable [SU] impacts); and (2) potentially significant and significant impacts that would be reduced to a less-than-significant level by the identified mitigation measures (potentially significant mitigable [PSM] and significant mitigable [SM] impacts). In nearly all cases, unless specifically stated, the impacts relate to the proposed actions at the LCSD site and not those at the Sampling Station #5 site. There were no PSU or SU impacts identified for the Sampling Station #5 site.

8.3.2.1 Construction-Related Impacts

Potentially Significant Unavoidable and Significant Unavoidable Construction Impacts

- **Noise.** Significant and unavoidable noise impacts would result from proposed nighttime construction at the LCSD site because noise levels would exceed sleep interference thresholds at the closest residential receptors, and noise from backup alarms for trucks used during nighttime construction would be audible at the closest residential receptors (Impact NO-1, SU), even with the implementation of mitigation measures. In addition, there would be a significant and unavoidable impact from noise levels generated by trucks traveling along Polhemus Road during nighttime construction that would exceed sleep interference thresholds at residential receptors, and there is no feasible mitigation measure (Impact NO-3, SU).

- **Cumulative Noise.** Potentially significant and unavoidable cumulative noise impacts associated with construction-related noise would occur because implementation of the project would result in a cumulatively considerable contribution to combined and prolonged noise disturbance in the LCSD site vicinity, including disturbance from concurrent nighttime construction from two projects and from truck noise along Polhemus Road during nighttime hours; these cumulative noise levels could exceed speech and sleep interference thresholds, even with the implementation of mitigation measures (Impact C-NO, PSU).

- **Air Quality.** Significant and unavoidable air quality impacts would result from construction-related emissions of engine exhaust that would exceed the significance threshold *proposed* by the Bay Area Air Quality Management District (BAAQMD) for an ozone precursor, even with the implementation of mitigation measures (Impact AQ-1, SU). (Refer to discussion under Potentially Significant Mitigable and Significant Mitigable Construction Impacts, below, regarding Impact AQ-1 under *adopted* BAAQMD thresholds.)

- **Cumulative Air Quality.** Significant and unavoidable cumulative air quality impacts associated with construction-related emissions would occur, based on BAAQMD's *proposed* significance thresholds, because implementation of the project would result in a cumulatively considerable contribution to exceedance of nitrogen oxides thresholds and to the region's nonattainment status for ozone, even with the implementation of mitigation measures (Impact C-AQ, SU). (Cumulative air quality impacts associated with construction related emissions would be less than significant under BAAQMD's *adopted* thresholds.)

- **Cumulative Recreation.** Significant and unavoidable cumulative recreation impacts would occur because implementation of the project would result in a cumulatively considerable contribution to the combined and prolonged disruption to recreational resources in the LCSD vicinity, including disruption of bicycle routes, due to continuous construction activities from the proposed project and other past, present, and reasonably foreseeable future projects for up to four years, even with the implementation of mitigation measures (Impact C-RE, SU).

Potentially Significant Mitigable and Significant Mitigable Construction Impacts

- **Land Use.** Construction activities at the LCSD and Sampling Station #5 sites could result in the temporary disruption or displacement of existing land uses, including residential and recreational land use activities (Impact LU-1, PSM), but notification of potentially affected residents and recreationists (Mitigation Measure M-LU-1a) and appropriate scheduling of events at the Pulgas Water Temple (Mitigation Measure M-LU-1b) would reduce this impact to a less-than-significant level.

- **Aesthetics.** Use of the vista point and nearby land for staging areas would result in changes in the visual character of these areas (Impact AE-1, PSM), but implementation of a landscaping plan (Mitigation Measure M-AE-1) would ensure that these areas are restored to their preconstruction conditions. Light or glare from nighttime construction would be visible from nearby residences (Impact AE-2, PSM), but would be mitigated with a site-specific construction lighting plan (Mitigation Measure M-AE-2).

- **Cultural and Paleontological Resources.** Although unlikely, construction activities at the LCSD and Sampling Station #5 could result in accidental damage to or destruction of significant archaeological resources (Impact CP-3, PSM). Excavations required for the stilling basin could also result in impacts on significant paleontological resources (Impact CP-4, PSM). Project construction at both the LCSD and Sampling Station #5 sites could potentially encounter unrecorded human remains, resulting in direct impacts on these remains (CP-5, PSM). Implementation of measures to address the accidental discovery of these resources (Mitigation Measures M-CP-3, M-CP-4, and M-CP-5) would reduce these impacts to a less-than-significant level.

- **Transportation and Circulation.** The temporary closure of Skyline Boulevard to vehicles and bicycles and implementation of detour routes would result in a temporary reduction in roadway capacity and increases in traffic delays, including potential delays for emergency service providers (Impact TR-1, PSM). Increased truck traffic on Crystal Springs Road could potentially affect bicycle operations on this road (Impact TR-2, PSM). Increased congestion and closure of a portion of Skyline Boulevard could impair access to adjacent roadways and land uses, including emergency access (Impact TR-3, PSM). The project would potentially result in increased safety hazards for vehicles, bicyclists, and pedestrians on public roadways during construction (Impact TR-5, PSM). Implementation of a traffic control plan (Mitigation Measure M-TR-1) would reduce Impacts TR-1, TR-2, TR-3, and TR-5 to a less-than-significant level. In addition, even with implementation of mitigation measures identified for the above impacts, the LCSDI's contribution to cumulative traffic increases on local and regional roads would combine with and extend the duration of construction activities from multiple projects in the LCSD vicinity (Impact C-TR, PSM), thus requiring the implementation of an additional, coordinated, regional transportation management plan to reduce impacts to a less-than-significant level.

- **Noise and Vibration.** Construction noise levels could exceed the San Mateo County Noise Ordinance noise limits for the operation of mechanical equipment (Impact NO-2, SM), but implementation of administrative and source controls (Mitigation Measure M-NO-1) would reduce this impact to a less-than-significant level. At Sampling Station #5, construction-related noise increases could exceed speech interference thresholds for visitors to the Pulgas Water Temple (Impact NO-1, PSM), but would be mitigated to a less than-significant level through implementation of event scheduling mitigation identified in Section 5.2, Land Use (Mitigation Measure M-LU-1b). Blasting during excavation at the stilling basin site would generate noise levels exceeding noise ordinance limits and disturb the closest residential receptors (Impact NO-4, SM), but blasting noise controls (Mitigation Measure M-NO-4) could reduce this impact to a less-than-significant level.

- **Air Quality**. Potentially significant air quality impacts would result from construction-related dust emissions, which are considered by BAAQMD to be significant unless mitigated, and from emissions of engine exhaust that would exceed the BAAQMD's *adopted* significance thresholds for an ozone precursor (Impact AQ-1, PSM), but would be mitigated to a less-than-significant level with implementation of BAAQMD-recommended dust control measures (Mitigation Measure M-AQ-1a) and BAAQMD-recommended exhaust control measures (Mitigation Measure M-AQ-1b). (Refer to discussion under Potentially Significant Unavoidable and Significant Unavoidable Construction Impacts, above, regarding Impact AQ-1 under *proposed* BAAQMD thresholds.

- **Recreation.** Temporary conflicts with established recreational uses would occur during construction due to the combination of increased noise and dust, reduced parking for recreationists, impeded vehicle access to recreational resources, impeded access to popular bicycle routes, and increased traffic and traffic safety hazards (Impact RE-1, SM), but implementing a traffic control plan (Mitigation Measure M-TR-1), notifying bicycle organizations of detours (Mitigation Measure M-RE-1), prescribing noise controls (Mitigation Measure M-NO-1), and implementing air quality controls (Mitigation Measure M-AQ-1) would reduce this impact to a less-than-significant level.

- **Utilities and Service Systems.** Construction activities at the LCSD site could potentially disrupt or damage Caltrans, Pacific Gas & Electric Company, U.S. Geological Survey, and/or California Geological Society facilities located in the vicinity of the dam. (Impact UT-1, PSM), but coordinating final construction plans with affected utilities (Mitigation Measure M-UT-1) would reduce this impact to a less-than-significant level. Construction activities would require temporary relocation of a Caltrans pipeline and a U.S. Geological Survey and/or California Geological Society facilities (Impact UT-2, PSM), but coordinating final construction plans with affected utilities (Mitigation Measure M-UT-1) would reduce this impact to a less-than-significant level. If excavated material from the proposed project is not utilized onsite under the Crystal Springs/San Andreas Transmission Upgrade project and requires offsite disposal, the project would be out of compliance with local solid waste statutes (Impact UT-4), but implementing a waste management plan (Mitigation Measure M-UT-4) would reduce this impact to a less-than-significant level.

- **Biological Resources.** Construction at the top and toe of the LCSD would result in both the temporary and permanent loss of wetlands, aquatic resources, and riparian habitat, and the placement of fill in jurisdictional waters (Impact BI-1, SM). Construction at Sampling Station #5 on the southern side of the Pulgas Discharge Channel could result in the direct loss of riparian habitat and possibly wetlands (Impact BI-1, SM). Impacts on wetlands, aquatic resources, and riparian habitat at both sites would be mitigated to a less-than-significant level through implementation of a worker training program (Mitigation Measure M-BI-1a), avoidance and restoration (Mitigation Measure M-BI-1b), wetland creation and enhancement (Mitigation Measure M-BI-1c), and implementation of a stormwater pollution prevention plan with site-specific best management practices (Mitigation Measure M-HY-3). Construction at the toe of the dam would result in the loss of mature trees protected by a local ordinance (Impacts BI-2 and BI-5, SM), but this impact would be reduced to a less-than-significant level by implementing a tree replacement program (Mitigation Measure M-BI-2), a worker training program (Mitigation Measure M-BI-1a), and avoidance and restoration actions (Mitigation Measure M-BI-1b). In addition, sensitive vegetation at the Boat Ramp staging area would be protected by implementing general avoidance measures (Mitigation Measure M-BI-3g). Construction at the top and toe of the dam would affect California red-legged frog, San Francisco garter snake, San Francisco dusky woodrat, and protected bird and bat species, including direct mortality and/or habitat effects (Impact BI-3, SM), and construction at Sampling Station #5 could result in direct mortality of California red-legged frog and San Francisco garter snake (Impact BI-3, PSM). Implementation of the following measures at both sites would reduce these impacts to a less-than-significant level: providing a biological monitor (Mitigation Measure M-BI-3c), conducting preconstruction surveys and avoiding nesting birds (Mitigation Measure M-BI-3d), implementing general avoidance measures (Mitigation Measure M-BI-3g), conducting a worker training program (Mitigation Measure M-BI-1a), implementing avoidance and restoration (Mitigation Measure M-BI-1b), and conducting wetland creation and enhancement (Mitigation Measure M-BI-1c). In addition, at the dam site, the following measures would reduce impacts on special-status species to a less-than-significant level: relocating frogs (Mitigation Measure M-BI-3a), installing an exclusion fence (Mitigation Measure M-BI-3b), avoiding roosting bats (Mitigation Measure M-BI-3e), and avoiding woodrat middens during the breeding season (Mitigation Measure M-BI-3f).

Construction impacts due to water quality effects from increased sediment and turbidity and contaminant releases could affect sensitive fishery resources (Impact BI-11, PSM), but implementing a stormwater pollution prevention plan with site-specific best management practices (Mitigation Measure M-HY-3) along with a worker training program (Mitigation Measure M-BI-1a) and avoidance and restoration actions (Mitigation Measure M-BI-1b) would reduce this impact to a less-than-significant level. Construction dewatering activities would result in disturbance and direct injury to steelhead (Impact BI-12, SM), and potential damage to fish could occur if blasting were used for demolition and excavation of the stilling basin (Impact BI-12, PSM). Implementing a fish rescue and relocation program and a vibration monitoring (Mitigation Measures M-BI-12a and M-BI-12b) along with a worker training program (Mitigation Measure M-BI-1a), avoidance and restoration actions (Mitigation Measure M-BI-1b), exclusion fencing (Mitigation Measure M-BI-3b), biological monitoring (Mitigation Measure M-BI-3c), and general avoidance measures (Mitigation Measure M-BI-3g) would reduce this impact to a less-than-significant level. Conducting vibration monitoring and adjusting blasting methods (Mitigation Measure M-BI-12c) accordingly would reduce the potential impacts of blasting to a less-than-significant level.

- **Geology and Soils.** Excavation for the stilling basin could result in erosion and the loss of topsoil (Impact GE-2, PSM); replacing the topsoil at the completion of construction (Mitigation Measure M-GE-2) would reduce this impact to a less-than-significant level.

- **Hydrology and Water Quality.** Construction of the proposed project could affect water quality in Crystal Springs Reservoir, along lower San Mateo Creek near the LCSD site, and in the vicinity of Sampling Station #5 (Impact HY-3, PSM). Preparing and implementing a stormwater pollution prevention plan with site-specific best management practices (Mitigation Measure M-HY-3) would reduce this impact to a less-than-significant level.

- **Hazards and Hazardous Materials.** Excavation at the stilling basin site could expose workers or the public to naturally occurring asbestos (Impact HZ-2, SM), but this impact would be reduced to a less-than-significant level by determining the concentration of naturally occurring asbestos in the rock prior to construction and implementing asbestos dust controls as appropriate (Mitigation Measure M-HZ-2). Removal of the stoplogs would require workers to handle pressure-treated wood (Impact HZ-3, SM), but appropriate management of treated wood waste (Mitigation Measure M-HZ-3) would reduce this impact to a less-than-significant level. Storage and use of construction-related hazardous materials at both the LCSD and Sampling Station #5 could result in accidental hazardous materials release (Impact HZ-4, PSM), but implementing the provisions of a stormwater pollution prevention plan (Mitigation Measure M-HY-3) would reduce this impact to a less-than-significant level.

8.3.2.2 Operations-Related Impacts

Potentially Significant Unavoidable and Significant Unavoidable Operations Impacts

- **Aesthetics.** The loss of 50.2 acres of established woodlands/forest (consisting of 31.6 acres of oak woodlands, 14.8 acres of mixed evergreen forest, and 3.8 acres of non-native forest) around the perimeter of the reservoir associated with increased reservoir operating levels would result in long-term changes in views of the watershed, including interim visual changes associated with dying trees (Impact AE-4, SM); this impact would be mitigated to a less-than-significant level through the development and implementation, where feasible, of a tree removal plan (Mitigation Measure M-AE-4). Mitigation Measure M-AE-4, however, provides that the SFPUC shall not implement a tree removal plan at any site where tree removal could result in significant unavoidable impacts to special-status biological resources, sensitive habitats, or where SFPUC lacks a reasonable means of access. To the extent that prevention of potentially significant and unavoidable biological impacts restricts the SFPUC's ability to fully implement a tree removal plan under Mitigation Measure M-AE-4, the proposed project would result in a potentially significant and unavoidable aesthetic impact.

Potentially Significant Mitigable and Significant Mitigable Operations Impacts

- **Cultural and Paleontological Resources.** The higher reservoir water levels could affect the South Crystal Springs Cottage, a historic resource (Impact CP-6, SM), but conducting and implementing the recommendations of a geotechnical study on the retaining wall would reduce this impact to a less-than-significant level (Mitigation Measure M-CP-6).

- **Biological Resources.** The proposed increase in the maximum normal operational water levels in Crystal Spring Reservoir would result in the loss of 13.5 acres of wetlands (Impact BI-6, SM); the loss of 8.3 acres of serpentine grasslands and 31.6 acres of oak woodlands (Impact BI-7, SM); impacts on two listed plant species (fountain thistle, Marin western flax) plus other special-status plants; and direct mortality and/or habitat effects on special-status animal species, including San Francisco garter snake and California red-legged frog (Impact BI-8: SM). The loss of oak woodlands due to the increase in reservoir operating levels and to the short-term exceedances would conflict with a local ordinance protecting biological resources (Impact BI-10, SM). Operational impacts on biological resources would be mitigated to a less-than-significant level through implementation of a worker training program (Mitigation Measure M-BI-1a), avoidance and restoration (Mitigation Measure M-BI-1b), wetland creation and enhancement (Mitigation Measure M-BI-1c), serpentine grassland enhancements (Mitigation Measure M-BI-7a), oak woodland mitigation program (Mitigation Measure M-BI-7b), special-status seed plantings (Mitigation Measure M-BI-8a), shrub and grassland enhancement for upland refugia (Mitigation Measure M-BI-8b), and non-native predator control (Mitigation Measure M-BI-8c). The project's contribution to a cumulative loss of sensitive biological resources during construction would be potentially significant (Impact C-BI, PSM), and coordinated implementation of exclusion fencing and provision of biological monitoring (Mitigation Measures M-C-BI, M-BI-3b, and M-BI-3c) would reduce this impact to a less-than-significant level.

8.3.2.3 Design Impacts

Significant Unavoidable Design Impacts

- **Historic Resources.** Significant and unavoidable impacts on historic resources would result from the proposed modifications to the LCSD, a historic resource, even with the implementation of mitigation measures (Impact CP-1, SU).

- **Cumulative Historic Resources**. Significant and unavoidable cumulative cultural resources impacts would result, since the LCSDI project's contribution to impacts on historic architectural resources in combination with impacts of the Crystal Springs/ San Andreas Transmission Upgrade project on historic architectural resources in the vicinity would be cumulatively considerable (significant), even with the implementation of mitigation measures (Impact C-CP, SU).

Significant Mitigable Design Impacts

- **Biological Resources.** The proposed enlarged stilling basin would result in the permanent loss of Pool 1, which is potential rearing habitat for juvenile steelhead, and would result in the loss of riparian vegetation, shaded riverine aquatic cover, and aquatic habitat (Impact BI-13, SM). However, enhancement of Pool 2 (Mitigation Measure M-BI-13) would reduce this impact to a less-than-significant level.

8.3.3 Approach to Alternatives Selection

The alternatives selection process for the LCSDI project was guided, in part, by the magnitude and severity of the impacts identified, with particular focus on strategies that could lessen or avoid significant and unavoidable impacts. As described above in Section 8.3.2, few impacts—none of which would be unavoidable—would occur at Sampling Station #5, and all would be associated with short-term construction activities. At the LCSD site, the majority of physical environmental effects that would occur under the proposed project are associated with construction activities, although the proposed design and operations would also result in adverse physical environmental effects. Proposed construction at the LCSD site would result in SU and PSU impacts with respect to noise, air quality, and recreation as well as SM and PSM impacts with respect to land use, aesthetics, cultural resources, transportation and circulation, noise and vibration, recreation, utilities, biological resources, geology and soils, water quality, and hazardous materials. Proposed operations would result in SM and PSM impacts with respect to aesthetics, cultural resources, and biological resources, but would not result in significant and unavoidable impacts. The proposed design of the LCSDI project would result in an SU impact on historic resources as well as a SM impact on biological (fisheries) resources.

The discussion below explores various strategies to avoid or lessen PSU, SU, PSM, and SM impacts and identifies feasibility issues as well as the ability of potential alternatives to achieve the LCSDI project objectives. The alternatives selected for further analysis and comparison with the proposed project are described and evaluated in Section 8.3.4, and the alternatives considered but rejected from further study are discussed in Section 8.6. Alternative project locations were not considered a feasible method of reducing any of the identified impacts, since an alternative location would not achieve any of the project's basic objectives (see Sections 8.5 and 8.6 below for further discussion).

8.3.3.1 Strategies to Avoid or Lessen Construction Impacts at the Sampling Station Site

The impacts due to proposed construction activities at Sampling Station #5 would be limited to the four-month duration of construction. The following SM and PSM impacts were identified: potential for temporary disruption or displacement of existing recreational activities at the Pulgas Water Temple (Impact LU-1); accidental damage to or destruction of archaeological resources (Impact CP-3); potential to encounter paleontological resources (Impact CP-4); potential to encounter human remains (Impact CP-5); construction-related noise increases potentially exceeding speech interference thresholds for visitors to the Pulgas Water Temple (Impact NO-1); loss of riparian habitat and possible wetlands (Impact BI-1); loss of mature willow trees (Impacts BI-2 and BI-5); potential for direct mortality of California red-legged frog and San Francisco garter snake (Impact BI-3); water quality impacts from construction-related increased soil erosion and sedimentation (Impact HY-3); and storage and use of construction-related hazardous materials potentially resulting in an accidental hazardous materials release (Impact HZ-4).

As described in Chapter 5, Environmental Setting, Impacts, and Mitigation Measures, all of the above impacts could be reduced to a less-than-significant level with implementation of standard mitigation measures. Mitigation Measure M-NO-1 (Administrative and Source Controls) specifies implementation of a noise control plan that would require, among other controls, the use of best available noise control techniques; Mitigation Measure M-LU-1b (Event Scheduling at the Pulgas Water Temple) would require that the SFPUC restrict scheduling of special events at the Pulgas Water Temple during the four-month construction period. Implementation of this measure would reduce both the land use and noise impacts to less-than-significant levels. Implementation of Mitigation Measures M-BI-1a (Worker Training Program); M-BI-1b (Avoidance and Restoration); M-BI-1c (Wetland Creation and Enhancement for Construction Impacts); and M-BI-3b (Exclusion

Fence) would reduce the impacts on biological resources to a less-than-significant level. Implementation of Mitigation Measure M-HY-3 (Preparation and Implementation of a Stormwater Pollution Prevention Plan) would reduce both the water quality and hazards impacts to less-than-significant levels. These mitigation measures are standard measures included in typical, SFPUC construction contracts, and would likely be required regardless of any alternative change in construction strategy at Sampling Station #5.

Relocating the sampling station to another site (other than along the Pulgas Discharge Channel) to avoid impacts on biological resources would not be feasible, since the function of the sampling station is to monitor water quality along the channel prior to discharging water to Upper Crystal Springs Reservoir. Any alternative construction strategy (using different equipment, following a different schedule, etc.) or relocating the sampling station to a different location along the discharge channel would have essentially the same impacts as those of the proposed project. Accordingly, other than the No Project Alternative, in which no construction or construction impacts would occur, no alternative construction strategies are proposed for Sampling Station #5 (although some operational alternatives, described below, would obviate the need for this project component). Thus, there are no feasible alternatives for proposed actions at Sampling Station #5 that would meet most of the project objectives while avoiding or substantially lessening the significant environmental impacts.

8.3.3.2 Strategies to Avoid or Lessen Construction Impacts at the LCSD Site

As described in Chapter 3, Project Description, all major construction activities at the LCSD site would occur over a nine-month period and would include up to six months of 24-hour construction. The intensive nine-month construction period at the LCSD site, with concurrent construction activities at the top and toe of the dam, is critical to meeting the basic project objectives. Both work areas at the top and toe of the dam are severely limited in size and access, and construction would require multiple crews and equipment working concurrently a several locations (e.g., separate crews working concurrently at the top of the dam from the left and right sides as well as a crew working at the stilling basin).

While not specifically mandated by the DSOD, substantial completion of proposed improvements to the dam and stilling basin must be accomplished during the dry season to the extent feasible in order to ensure that the structural integrity of the dam is maintained during construction (URS, 2009). If a spill over the dam were to occur while construction is in progress (i.e., when there is no functioning spillway or stilling basin), the structural integrity of the dam could be compromised, which could create a public safety hazard. From a dam safety perspective, therefore, the demolition and construction activities that affect the functioning of the spillway and stilling basin would be scheduled when there is a very low probability of spills to San Mateo Creek; the corresponding construction work window extends from approximately April 15 to November 15 (which, by necessity, includes the early part of the rainy season). It is expected that the construction contractor would be required to utilize additional shifts and night work beyond the standard single-shift, 40-hour work week, even with multiple crews working concurrently at several locations, to meet the requirements of this tight construction schedule. The use of multiple shifts and night work would reduce risk, improve efficiency, and provide a method to recover from unexpected delays or other unforeseen issues (URS, 2009).

Therefore, an intensive nine-month construction period, including nights and weekends, is proposed in order to provide adequate dam safety precautions in the absence of a functioning spillway and stilling basin. Any alternative construction scenario that could not achieve substantial completion of the dam and stilling basin improvements between April 15 and November 15 is considered infeasible.

The construction-related noise impacts (Impacts NO-1, NO-2, NO-3, and C-NO), including the significant and unavoidable impacts (Impacts NO-1, NO-2, and C-NO), are due in large part to the nighttime construction, which would exceed sleep interference thresholds, even with the implementation of mitigation measures. As stated above, since nighttime construction is deemed necessary for project implementation, there are no feasible alternative strategies to avoid these noise impacts. Mitigation Measures M-NO-1 (Administrative and Source Controls), M-NO-2 (Limiting Construction Hours to the extent feasible), and M-C-NO (Coordinated Noise Control Plan) would lessen the effects of these impacts to the extent feasible, but not to a less-than-significant level. As described in Section 8.6, below, an extended 18-month construction schedule that would avoid nighttime construction was considered but rejected from further consideration due to the potential public safety issues associated with construction over the course of a rainy season.

Under proposed BAAQMD significance thresholds, project construction would result in significant and unavoidable air quality impacts (Impacts AQ-1 and C-AQ), because estimated emissions from construction equipment and vehicles would generate levels in excess of the proposed BAAQMD CEQA significance thresholds for nitrogen oxides, a precursor for ozone. Even with implementation of Mitigation Measure M-AQ-1b (Exhaust Control Measures) and Mitigation Measure M-AQ-1c (Additional Exhaust Control Measures), emissions from project construction activities would result in significant direct and cumulative impacts, exceeding the nitrogen oxide thresholds, particularly since the project is located within a designated nonattainment region for ozone. As described above, an intensive nine-month construction period is proposed for project implementation, and it would not be feasible to reduce the amount of construction equipment (in order to lower the exhaust emission levels) and still complete project construction within nine months. Therefore, there are no feasible construction strategies to avoid or lessen these significant air quality impacts under the proposed BAAQMD thresholds. Under BAAQMD's adopted CEQA thresholds, Mitigation Measures M-AQ-1a and M-AQ-1b would reduce the proposed project's potentially significant construction impacts (Impact AQ-1) to a less-then significant level; the project's contribution to cumulative impacts would be less than significant without mitigation.

The project's contribution to cumulative recreation impacts due to the combined and prolonged effects on recreational resources in the LCSD vicinity, including the disruption of bicycle routes, would be significant and unavoidable. As stated above, the proposed project already includes an intensive nine-month construction period with multiple shifts and 24-hour construction, and it is not feasible to reduce the construction period any further. In addition, construction activities associated with demolition and replacement of the Skyline Boulevard Bridge must be conducted in sequence with those of the LCSDI project, and the proposed project already includes coordination efforts with San Mateo County to minimize the duration of the closure of this section of Skyline Boulevard. Therefore, there are no feasible construction strategies to avoid or lessen this cumulative impact on recreation due to the combined and prolonged effects of multiple construction projects in the same vicinity.

The other potentially significant and significant but mitigable (PSM and SM) impacts due to construction activities at the LCSD site include effects on land use, aesthetics, cultural resources, transportation and circulation, noise and vibration, recreation, utilities, biological resources, geology and soils, water quality, and hazards, as described in Chapter 5, Environmental Setting, Impacts, and Mitigation Measures, and summarized above in Section 8.3.2. Mitigation measures are identified in Chapter 5 of this EIR that would reduce all of these impacts to a less-than-significant level. In many cases, these mitigation measures are standard measures included in typical SFPUC construction contracts, and these measures would likely be required regardless of any alternative construction strategy. For the impacts that require atypical, site-specific mitigation measures, including those pertaining to transportation and circulation, noise, recreation, and biological resources, there are no alternative construction strategies that would avoid or lessen these effects, especially since an alternative project location is not feasible. For impacts on biological resources, mitigation measures consistent with resource agencies' requirements would be required regardless of the construction strategy. Therefore, in order to minimize the construction impacts on the identified resources, the mitigation measures in Chapter 5 represent the most feasible approach to lessening these impacts.

In conclusion, there are no feasible alternative construction approaches or strategies that could attain most of the basic objectives of the proposed project while avoiding or lessening the identified significant or potentially significant construction impacts at the LCSD site.

8.3.3.3 Strategies to Avoid or Lessen Operational Impacts

Chapter 5, Environmental Setting, Impacts, and Mitigation Measures, of this EIR does not identify any significant and unavoidable impacts due to proposed project operations. However, as described in Chapter 5 and summarized in Section 8.3.2 above, project operations would result in PSM and SM impacts on aesthetics, cultural resources, biological resources, and recreation due to the proposed increase in reservoir operating levels. The impacts on these resources would occur due to the proposed increase in maximum normal operating levels from an elevation of 283.8 feet to 287.8 feet, which would increase the average annual storage in the reservoir and raise the elevation of the zone around the perimeter of the reservoir that would be partially or fully inundated. In addition, operational impacts on these resources could occur because proposed operations would include allowances for short-term exceedances above the maximum normal operating level of 287.8 feet. The water levels above 287.8 feet could last for up to 14 days, with two to three events in a single year; the frequency and duration of these occurrences would depend on hydrologic conditions, but could occur as often as one year in three.

Even though feasible mitigation measures have been identified, there would be substantial, long-term impacts on biological resources, including the loss of sensitive habitats (wetlands, serpentine grassland, and oak woodlands), and direct and/or habitat effects on numerous special-status species. Therefore, an alternative strategy to reduce operational impacts on biological resources (which would also address impacts on aesthetics and cultural resources) would be either to reduce the proposed maximum normal reservoir operating level and/or to reduce or eliminate the short-term exceedances above 287.8 feet. This alternative operating strategy is incorporated into the Lowered Spillway Crest Alternative, which is discussed below.

8.3.3.4 Strategies to Avoid or Lessen Design Impacts

The proposed design of the dam improvements would result in three significant impacts: a significant and unavoidable impact on the LCSD as a historic resource due to the proposed modifications to this resource; a significant and unavoidable cumulative impact on historic resources; and a significant but mitigable impact on biological resources due to the permanent removal of Pool 1, which is potential rearing habitat for juvenile steelhead. Although the SFPUC examined alternative designs for the proposed dam improvements (see Sections 8.5 and 8.6, below, for further description), the primary purpose of the dam improvements is to achieve compliance with the DSOD directive. Any structural improvements to the dam that would comply with DSOD requirements, regardless of the specific design, would modify the historical characteristics of the dam (SFPUC, 2007). Therefore, alternative design strategies that would avoid or lessen the impact on the LCSD as a historic resource would be infeasible because the LCSD modifications must comply with the DSOD requirements for structural improvements.

Construction of the new enlarged stilling basin would result in the permanent loss of Pool 1, downstream of the existing stilling basin. Similar to the dam, the stilling basin design must comply with DSOD requirements, and an alternative location for the stilling basin is not feasible. The size of the proposed stilling basin is based on design requirements for the Probable Maximum Flood (PMF) and for the widened spillway, and construction of the new stilling basin would necessitate the permanent loss of Pool 1. Therefore, an alternative design strategy to avoid or lessen this impact is not feasible. However, it should be noted that implementation of Mitigation Measure M-BI-14 (Enhancement of Existing Habitat) would fully compensate for the permanent loss of potential rearing habitat for steelhead because this fragmented habitat would be replaced with enhanced, higher quality habitat directly downstream in Pool 2.

In conclusion, there are no feasible alternative design approaches or strategies that could attain most of the basic objectives of the proposed project and that would avoid or lessen the identified significant design impacts at the LCSD site.

8.3.4 Selected CEQA Alternatives

As described above, the specificity of DSOD regulatory requirements for the proposed project along with the need to protect public safety impose severe constraints on the range of feasible alternatives for consideration in this EIR. Section 8.3.3, above, explains why there are no feasible construction, design, or siting alternatives that could attain most of the basic project objectives and that would avoid or lessen impacts of the project. The range of feasible alternatives only addresses operational considerations, and as described further below, there are limitations on possible operational alternatives.

In identifying operational alternatives, any such alternatives must also consider long-term operation of the LCSD and Crystal Springs Reservoir as one component of the systemwide operations of the regional water system. Furthermore, the ability of an alternative to attain most of the basic project objectives must be evaluated in the context of the overall WSIP goals and objectives. As described in Section 8.2, seven systemwide alternatives to the WSIP were considered and evaluated in the WSIP PEIR, and the LCSDI project was incorporated into all of the WSIP alternatives. Within the overall context of the WSIP alternatives, only one alternative, the Modified WSIP Alternative, specifically addressed the LCSDI project. The Modified WSIP Alternative recommended modifying operation of Crystal Springs Reservoir to manage the inundation levels to reduce or avoid impacts on biological resources. As a result of the PEIR analysis of the Modified WSIP Alternative, the SFPUC changed the design of the LCSDI project by reducing the maximum normal operating level from 291.8 feet (the historical capacity) to 287.8 feet (the project as currently proposed). Thus, the proposed project currently incorporates an element of the Modified WSIP Alternative, which was designed to lessen environmental impacts. The SFPUC was able to "redesign" the LCSDI project to incorporate this element while at the same time achieving all of the project-specific objectives and maintaining the LCSDI project's contribution to achieving the overall WSIP goals and level of service objectives.

Therefore, the range of feasible alternatives for CEQA evaluation is limited to two alternatives: the No Project Alternative and the Lowered Spillway Crest Alternative. These two alternatives were determined to adequately represent the range of feasible alternatives required under CEQA, since any other operational alternative would represent the same intent as the Lower Spillway Crest Alternative, and no feasible construction, design, or siting alternatives exist. These alternative scenarios are described and evaluated below.

8.3.4.1 No Project Alternative

As required by CEQA Guidelines Section 15126.6(e), the No Project Alternative must be evaluated along with its impacts to allow decision-makers to compare the impacts of approving the proposed project with the impacts of not approving it. The No Project Alternative represents what would be reasonably expected to occur in the foreseeable future if the project were not approved.

Description of the No Project Alternative

Lower Crystal Springs Dam Vicinity. In the event that the SFPUC does not approve the LCSDI project, it is presumed that the DSOD would change the existing, temporary restrictions on reservoir operating levels to permanent restrictions. Furthermore, it is likely that the DSOD would impose additional operating level restrictions on the Crystal Springs Reservoir system (SFPUC, 2007).

The current temporary restrictions require the SFPUC to limit the maximum normal operating water surface elevation in Crystal Springs Reservoir to 283.8 feet until dam improvements are implemented; this temporary restriction and the maximum normal operating water level was established based on an analysis conducted in 1981 of the peak flow expected under the PMF. In 2006, the DSOD updated its methods for calculating the PMF, and the current calculations indicate that the PMF would be roughly double the size of the PMF calculated by the old methods. The DSOD has indicated that if the SFPUC does not intend to implement dam improvements, the DSOD would need to issue permanent, updated dam operating restrictions based on the current calculations of the PMF. The current PMF calculations could result in a maximum normal operating level that is an additional 15 feet below the existing elevation of 283.8 feet (SFPUC, 2007).

Therefore, under the No Project Alternative, the LCSD structure would remain as it is at present, with no modifications or improvements, but the operating requirements for Crystal Springs Reservoir would change from current conditions. The maximum normal operating level could be reduced to as low as 268.8 feet.

Sampling Station #5 Site. The sampling station would remain as it currently exists, at an elevation of 287.5 feet, and would continue to be operated the same as under existing conditions. Because the DSOD would require that the reservoir operating levels be lowered substantially below the elevation of the sampling station, there would be no possibility that the sampling station equipment would be inundated, and there would be no need to raise the sampling station.

Ability of the No Project Alternative to Meet Project Objectives

The No Project Alternative would fail to meet all of the LCSDI project objectives. It would also fail to meet the WSIP goals and objectives that rely directly on the contribution of the LCSDI project to fulfill systemwide level of service objectives. While the SFPUC would comply with DSOD requirements under this alternative, the No Project Alternative would not meet the objective of completing modifications to the existing facilities in compliance with the DSOD directive. Furthermore, the No Project Alternative would jeopardize the SFPUC's ability to meet (if not completely preventing it from meeting) the adopted WSIP goals and objectives, which would be counter to SFPUC Resolution 08-0200.

If the DSOD were to limit the maximum reservoir operating level to 268.8 feet, the capacity of Crystal Springs Reservoir would be reduced by over 40 percent compared to its historical capacity. The SFPUC would be severely limited in its ability to meet (and could possibly be prevented from meeting) its adopted WSIP seismic, delivery, and water supply reliability goals, particularly in the Peninsula and San Francisco regions, because of the extremely reduced local storage capacity on the Peninsula. This would curtail the SFPUC's ability to restore service after a major earthquake as well as restrict/prevent the SFPUC from conducting planned maintenance of individual facilities without interrupting customer service. In the event of an unplanned facility outage (such as a power failure or other unforeseen event), the SFPUC would be severely limited in its ability to serve water to customers on the Peninsula and in San Francisco. During drought periods, the SFPUC would be unable to limit rationing to a maximum 20 percent systemwide reduction, and customers on the Peninsula and in San Francisco would be most affected and would likely be subject to the greatest cutbacks in water supply. Overall, with the severe reduction of storage capacity in Crystal Springs Reservoir that could occur under the No Project Alternative, the SFPUC would be limited in its ability to provide water to customers during both drought and nondrought periods and would not be able to fulfill part of its basic mission with respect to water supply reliability, which is "to serve San Francisco and its Bay Area customers with reliable, high-quality and affordable water."

Impacts of the No Project Alternative Compared to Those of the Proposed Project

Lower Crystal Springs Dam Site

Direct Impacts. The No Project Alternative would eliminate the need for construction activities in the LCSD site vicinity, thereby avoiding all construction impacts identified for the proposed project, including the PSU and SU impacts associated with noise, air quality, and recreation. All construction impacts related to land use, aesthetics, cultural resources, traffic, noise, recreation, utilities, biological resources, geology and soils, water quality, and hazards would be completely avoided. The numerous other proposed future projects in this site vicinity may still be implemented, including San Mateo County's Crystal Springs Dam Bridge Replacement project, and so cumulative construction impacts could still occur, but there would be no contribution to these impacts from the LCSDI project. The No Project Alternative would also eliminate any design modifications to the LCSD or the need to remove Pool 1, thereby avoiding all design-related impacts, including the SU impact on the LCSD as a historic resource and the SU cumulative impact on historic resources.

However, under the No Project Alternative, the revised operations would still result in significant impacts on biological resources and aesthetics, although the nature and extent of the impacts would differ from those described in Chapter 5 for the proposed project. With the maximum normal operating levels as much as 15 feet lower than current levels, the existing fluctuation zone around the perimeter of the reservoir would be lowered accordingly, and the inundation frequency at various contour elevations would change substantially from existing conditions. Similar to the proposed project, this change in inundation frequency in the fluctuation zone would alter the existing vegetation types in the range of elevations between the current and future fluctuation zone.

With the lowering of the average reservoir operating levels, there would be a loss of wetlands (including riparian, freshwater marsh [*Scirpus/Typha*], and herbaceous wetland) at the higher elevations, but reestablishment of wetlands at lower elevations. The wetland habitat lost at the higher elevations would likely be converted to upland woody vegetation and grassland habitat. Some of the existing open water and lacustrine habitat at the lower elevations would be converted to wetland habitat, but the extent of each cover type would depend on two factors: the pattern of inundation frequencies and the extent of available acreage within the inundation zone. The pattern of inundation frequencies would depend on reservoir operations and cannot be predicted without hydrologic modeling. One factor, however, would limit the potential extent of wetland development: the acreage in each 1-foot increment would decrease as the reservoir elevation drops, and thus the potential extent of wetland vegetation would be reduced. For example, the 8-foot elevation range between 275 and 283 feet encompasses 20 percent more acreage than the 15-foot lower elevation range between 260 and 268 feet. Although the potential losses and gains in the different habitat types cannot be quantified without hydrologic modeling, the change in habitat types and loss of wetlands would be a *significant* impact. In addition, associated with the change in vegetation types and habitat, significant impacts on special-status species would also be expected (i.e., direct mortality and/or habitat effects), including impacts on San Francisco garter snake and California red-legged frog, due to the sensitivity of the biological resources around the perimeter of Crystal Springs Reservoir (see Chapter 5, Section 5.13, Biological Resources, Section 5.13.1, Setting). Unlike the proposed project, the No Project Alternative would not affect existing serpentine grasslands and oak woodlands, which are located upland of the existing fluctuation zone and would remain so. However, a 15-foot drop in the reservoir elevation could lower, and possibly reduce, the available habitat for serpentine seep-dependent species such as fountain thistle. Lowering the reservoir levels would likely result in *significant* impacts on fish species present in the reservoir, including rainbow trout, reducing the aquatic habitat available for both warmwater and coldwater fish species; it would also reduce opportunities for connectivity and migration of fish between the reservoir and upstream tributary habitat. Mitigation measures for impacts on biological resources would likely be similar to those identified for the proposed project and could likely reduce impacts to a less-than-significant level.

With respect to aesthetics, the lowering of the reservoir operating levels would increase the size of the "bathtub ring" around the perimeter of the reservoir. Although existing habitat in the fluctuation zone would be converted to another type of habitat, depending on the changes in inundation frequency, the interim transition from one habitat to another would result in a significant visual impact based on the high visual sensitivity of the reservoir and watershed (see Chapter 5, Section 5.3, Aesthetics, Section 5.3.1, Setting). This impact would be *potentially significant*, depending on the actual changes in operating protocol and the permanent restrictions imposed by the DSOD, and mitigation measures may or may not be available to lessen this impact.

Under the No Project Alternative, if the maximum reservoir level were lowered to 268.8 feet, the capacity of Crystal Springs Reservoir would be reduced to about 13 billion gallons, only 58 percent of its historical capacity of 22.15 billion gallons. This reduction in water supply would have direct impacts on customers of the SFPUC regional water system, particularly those located in San Mateo and San Francisco Counties. Hydrologic modeling would be needed to predict the extent of impact on water delivery to these customers, but the reduction would be expected to severely reduce the reliability of water supplies during drought periods. In addition, as described below, there is the potential for secondary impacts associated with the reduced water supply storage.

Indirect or Secondary Impacts. If implemented, the No Project Alternative would result in secondary effects related to permanently lowering the reservoir water levels and reducing the storage in Crystal Springs Reservoir. In the event of such a loss in water supply, the SFPUC and/or its wholesale customers would likely take action to secure additional water to replace lost supplies from the reservoir in order to meet its goal of limiting rationing to a maximum 20-percent systemwide reduction in water service during extended droughts. Supplemental supply options include local groundwater projects, additional Tuolumne River diversions, and desalination (operated regionally or at Oceanside in San Francisco), but each of these options has the potential for adverse environmental effects that, in some cases, could be more severe than those associated with the proposed project. Wholesale customers might also be required to pursue supplemental dry-year supply to make up for drought period supply shortfalls, which could have similar or additional secondary environmental effects. The WSIP PEIR, which is incorporated by reference, provides additional detail on supplemental supply options and their associated environmental impacts (San Francisco Planning Department, 2008).

If the SFPUC and/or its wholesale customers were to pursue supplemental water supplies to compensate for the shortfall due to the No Project Alternative, the secondary effects could include: construction impacts and operational impacts such as groundwater overdraft, subsidence, saltwater intrusion, and water quality effects associated with development of groundwater sources; impacts on fisheries and biological resources, including sensitive species, associated with additional Tuolumne River diversions; and construction impacts and operational impacts on land use, aesthetics, hydrology and water quality, air quality, hazards, and energy associated with development of desalinated water supplies.

Sampling Station #5 Vicinity

The No Project Alternative would eliminate the need for all construction activities in the vicinity of the Pulgas Discharge Channel and Pulgas Water Temple. Compared to the proposed project, all direct impacts from construction activities, including the SM and PSM impacts related to land use, noise, biological resources, water quality, and hazards, would be avoided.

No Project Alternative – Conclusions

The No Project Alternative would meet none of the project objectives, would imperil the SFPUC's seismic, delivery, and water supply reliability, and would severely limit the SFPUC's ability to meet its customers' water supply needs during both drought and nondrought periods. At the LCSD site, the No Project Alternative would avoid all construction-related and design impacts that would occur under the proposed project, but significant adverse operational impacts on biological resources, aesthetics, and recreation would occur nonetheless, although the nature and extent of the impacts would differ from those of the proposed project. The No Project Alternative would also result in direct and indirect impacts associated with the reduction in water supply storage in

Crystal Springs Reservoir—with direct impacts on customers served by the system due to the reduced reliability to receive water during drought and nondrought periods, and indirect impacts associated with the potential that the SFPUC and/or its customers could seek to secure alternative water supplies. At Sampling Station #5, the No Project Alternative would avoid all identified impacts.

8.3.4.2 Lowered Spillway Crest Alternative

Description of the Lowered Spillway Crest Alternative

Lower Crystal Springs Dam Site. Under the Lowered Spillway Crest Alternative, the SFPUC would construct the same improvements to the dam and stilling basin as under the proposed project, but the permanent elevation of the spillway crest would be constructed to 287.8 feet rather than 291.8 feet. The intent of this alternative would be to avoid exceedences of the normal maximum water surface elevation, thereby reducing the magnitude and extent of impacts on biological resources.

Under this alternative, it is assumed that with the exception of raising Sampling Station #5, all the project components would be same as for the proposed project. The spillway and stilling basin would be the same design and have the same dimensions as those of the proposed project, except for the height of the spillway crest. It is assumed that the construction scenario would be the same as that for the proposed project, with a 9-month schedule for substantial completion of all construction and a 14-month total construction schedule. It is assumed that the same construction activities, staging, haul routes, workforce, and equipment would be required as described in Chapter 3 for the proposed project, including the potential use of barges for construction on the top of the dam and possible use of blasting for excavation of the stilling basin. This description is strictly theoretical in that no engineering design has been prepared for this alternative, and it is unknown if this alternative could safely accommodate the PMF. In addition, the DSOD has not approved this alternative. However, for the purpose of this CEQA alternatives analysis, it is assumed that an equivalent project with a spillway crest at 287.8 feet is feasible and could be designed to comply with the DSOD directive.

Under the Lowered Spillway Crest Alternative, it is assumed that the operating assumptions would be the same as those of the proposed project, with the maximum normal reservoir operating level limited to 287.8 feet. However, under this alternative, the spillway would be constructed to an elevation of 287.8 feet, and there would be no exceedances of more than a few inches above this level, except during the PMF and other extremely infrequent and very large storms. The upper extent of the inundation zone around the perimeter of Crystal Springs Reservoir would be limited to 287.8 feet. It is assumed that the SFPUC would operate the reservoir in essentially the same way as it does under existing conditions and would under the proposed project, with the operating goal of minimizing releases and spills to San Mateo Creek. This includes lowering the water surface elevation in the reservoir several feet below the maximum normal operating level during the rainy season so that operators could accommodate runoff from the reservoir's watershed without releasing or spilling water to San Mateo Creek. The wintertime flood reservation would be about 2 billion gallons, the same as under existing conditions and with the proposed project. However, in order to minimize the releases and spills to San Mateo Creek, the SFPUC might need to maintain a winter storage reservation for a longer period than under the proposed project (beyond March 1) and/or to maintain a larger winter storage reservation since it would be impossible to have exceedances with the lowered spillway.

Sampling Station #5 Site. The Lowered Spillway Crest Alternative would eliminate the need to raise Sampling Station #5, so the existing sampling station would remain as is and would continue to be operated the same as under existing conditions.

Ability of the Lowered Spillway Crest Alternative to Meet Project Objectives

The Lowered Spillway Crest Alternative would meet most of the project objectives, although it would only partially meet some of the objectives and would fail to meet one of the objectives. This alternative would only partially meet the WSIP goals and objectives that rely directly on the contribution of the LCSDI project to fulfill the systemwide level of service objectives.

This alternative would achieve the objective that the LCSD be modified in compliance with the DSOD directive, although this assumption was developed for the purpose of this alternatives analysis, and the SFPUC would need to conduct additional engineering studies and coordinate with the DSOD to definitively meet this objective. Also, by definition, this alternative would meet the objective of maximizing the capture of local runoff from the Peninsula watershed. As stated above, this alternative assumes that the SFPUC would operate the reservoir similar to existing operations and would minimize spills and releases to San Mateo Creek. Under this alternative, the SFPUC would lose operational flexibility compared to conditions with the proposed project because water surface elevations in the reservoir could never exceed the spillway elevation of 287.8 feet by more than a few inches. The SFPUC could begin to eliminate the flood reservation on March 1, but to do so would risk being unable to capture runoff from spring storms. Alternatively, the flood reservation could be retained through March and April to capture spring stormwater, but if spring storms did not materialize the SFPUC might have difficulty achieving its goal of a full reservoir by late spring or summer. In either case, the inability to accommodate a water surface elevation of more than a few inches above 287.8 feet would result in less capture of water than under the proposed project.

This alternative would fail to meet the objective of restoring the historical storage capacity of Crystal Springs Reservoir; instead, it would result in a permanent reduction of the historical capacity of the reservoir by about 6 percent.

The Lowered Spillway Crest Alternative would only partially achieve the objectives to: improve the SFPUC's water supply delivery capability; help meet the SFPUC's dry-year delivery needs; facilitate planned shutdown of individual facilities for regular maintenance without interrupting customer service; and increase water storage on the Peninsula. While this alternative would increase storage in Crystal Springs Reservoir compared to existing conditions, it would not fully achieve these objectives because short-term exceedances above 287.8 feet could not occur under this alternative. On average, the exceedances under the proposed project would provide about

1 billion gallons in increased storage, thereby increasing the SFPUC's ability to perform wintertime maintenance and to respond to earthquakes and other emergencies. Furthermore, this incremental increase in water supply storage would augment seismic reliability in terms of the system's ability to restore service to customers following an earthquake. An increase of 1 billion gallons of storage at Crystal Springs Reservoir would provide an additional 10 days of supply for customers on the Peninsula and in San Francisco in the event of an earthquake and/or when supplies from the Hetch Hetchy Aqueduct are not available. With respect to the effects on the regional water system, an additional 1 billion gallons in storage at Crystal Springs Reservoir effectively increases systemwide storage by this amount, which translates into 2.7 mgd of supply in the wettest 50 percent of water years (and 0.0 mgd in the driest 50 percent). On average, this would yield about 1.35 mgd of supply. This increase in supply is needed to meet the WSIP level of service objectives for delivery and water supply reliability, including in dry years when the SFPUC aims to limit rationing to a maximum of 20 percent systemwide (SFPUC, 2009).

For the same reasons described above, this alternative would only partially support the WSIP goals and objectives for seismic, water delivery, and water supply reliability. While this alternative would contribute to achieving the WSIP goals and objectives related seismic and delivery reliability, it would cause the SFPUC to fall short in achieving the WSIP water supply level of service objectives.

Impacts of the Lowered Spillway Crest Alternative Compared to Those of the Proposed Project

Lower Crystal Springs Dam Vicinity. The Lowered Spillway Crest Alternative would have all of the same construction-related impacts as the proposed project, including the PSU and SU impacts related to noise, air quality, and recreation, as described in Chapter 5, Environmental Setting, Impacts, and Mitigation Measures, and summarized in Section 8.3.2 above. Construction impacts related to land use, aesthetics, cultural resources, traffic, noise, recreation, utilities, biological resources, geology and soils, water quality, and hazards would be exactly the same as those of the proposed project, and the same mitigation measures would be required to reduce these impacts to a less-than-significant level.

The Lowered Spillway Crest Alternative would require the same design modifications to the LCSD and the same need to remove Pool 1 as under the proposed project. Therefore, all design-related impacts, including the SU impact on the LCSD as a historic resource and the cumulative SU impact on historic resources, would be the same as for the proposed project and the same mitigation measures would be required.

Under the Lowered Spillway Crest Alternative, the operational impacts would be reduced compared to those of the proposed project. The potential impact on South Crystal Springs Cottage as a historic resource would be avoided because the average reservoir water levels would be lower than under the proposed project. Since the maximum normal operating level of the reservoir would be 287.8 feet, the same as under the proposed project, impacts on biological resources would also be the same due to proposed normal operating protocols. These impacts would include the loss of 13.5 acres of wetlands (Impact BI-6, SM); the loss of 8.3 acres of serpentine grasslands and 19.6 acres of oak woodlands (Impact BI-7, SM); the loss of two special-status plant species (fountain thistle, Marin western flax); and direct mortality and/or habitat effects on special-status animal species, including San Francisco garter snake and California red-legged frog (Impact BI-8, SM). However, without the short-term exceedances of the maximum normal water surface elevation, this alternative would avoid the significant impact related to the loss of or damage to oak woodlands above 287.8 feet (approximately 12 acres). All other impacts on biological resources would be the same as those identified for the proposed project, and the same mitigation measures would be required, including the same measures for oak woodlands, although the magnitude of the measure would be reduced. The aesthetics impact related to long-term changes in views of the watershed associated with dying trees would be reduced compared to the proposed project, but not eliminated, because up to 19.6 acres of oak woodlands, 9.5 acres of mixed evergreen forest, and 2.0 acres of non-native forest could be lost due to the increase in the maximum normal reservoir operating level to 287.8 feet, even without the exceedances of the maximum normal water surface elevation. The same mitigation measure for this aesthetic impact would be required under this alternative as was identified for the proposed project, although possibly to a lesser magnitude depending on the access to and visibility of the lost acreages of woodlands from public viewpoints.

As described above, the Lowered Spillway Crest Alternative would result in reduced systemwide storage for the regional water system, and similar to the impacts described above for the No Project Alternative, a reduction in water supply could result in direct and indirect impacts. Reduced storage capacity would decrease the ability to perform wintertime maintenance and decrease the SFPUC's ability to respond to unplanned emergency system outages. And, during a prolonged drought, the loss of water supply storage would have direct impacts on customers if systemwide rationing were to exceed 20 percent. Indirect or secondary impacts could result if the SFPUC and/or its customers were to seek additional or alternative water supply options to compensate for the deficit (see discussion of Indirect or Secondary Impacts under the No Project Alternative above).

Sampling Station #5 Vicinity. The Lowered Spillway Crest Alternative would eliminate all construction activities in the vicinity of the Pulgas Discharge Channel and Pulgas Water Temple. Compared to the proposed project, all direct impacts from construction activities, including the SM and PSM impacts related to land use, noise, biological resources, water quality, and hazards, would be avoided.

Lowered Spillway Crest Alternative – Conclusions

The Lowered Spillway Crest Alternative would achieve some but not all of the project objectives and would only partially meet the seismic, delivery, and water supply reliability objectives of the WSIP. However, without the additional water supply provided by the exceedances, this alternative would impede the SFPUC's ability to meet the WSIP level of service objectives for seismic, delivery, and water supply reliability. This alternative would not avoid or eliminate any of the PSU or SU impacts. The construction and design impacts of this alternative would be essentially the same as those identified for the proposed project, but this alternative would avoid or reduce some of the operational impacts. This alternative would avoid the potential operational impact on the South Crystal Springs Cottage, and it would reduce the potential loss of oak woodlands from 31.6 to 19.6 acres due to the elimination of the short-term exceedances of the maximum normal water surface elevation from the proposed operations. The operational impact on aesthetics associated with the loss of woodlands and dying trees would be reduced (the total loss of woodlands would be reduced from 50.2 to 31.1 acres, but not all of this acreage would be visible from public viewpoints), but would not be avoided. With one exception (Mitigation Measure M-CP-6 related to the South Crystal Springs Cottage), all of the same mitigation measures as the proposed project would be required. All impacts at Sampling Station #5 would be avoided.

8.4 Comparison of Alternatives

The CEQA Guidelines require the identification of an environmentally superior alternative to the proposed project (Section 15126.6[e]). If it is determined that the "no project" alternative would be the environmentally superior alternative, then the EIR shall also identify an environmentally superior alternative among the other project alternatives (Section 15126.6[3]).

Table 8-1 presents a comparative summary of the impacts associated with the alternatives. All of the project alternatives, including the No Project Alternative, would result in significant adverse environmental impacts in the areas of biological resources and aesthetics.

Although the No Project Alternative would avoid all of the construction-related impacts and the significant, unavoidable impacts on historic resources that would occur under the proposed project, this alternative would achieve none of the project objectives and would not support any of the WSIP goals and objectives for seismic, delivery, or water supply reliability. It would be counter to the SFPUC's basic mission of providing a reliable water supply for its customers. The No Project Alternative would still result in significant adverse impacts on biological resources and aesthetics. There would be potential impacts on water supply customers of the regional water system, as well as potential secondary impacts if the SFPUC and/or its customers were to secure an alternative water supply. Thus, this alternative is not considered acceptable because of the potential effects of reduced water supply storage on water system customers, even though this alternative would result in a reduction in environmental impacts compared to the proposed project. The No Project Alternative is not considered the environmentally superior alternative.

The Lowered Spillway Crest Alternative would achieve some but not all of the project objectives and would partially contribute to achieving the WSIP goals and objectives for seismic, delivery, and water supply reliability. However, without the additional 1 billion gallons in water supply storage that would be provided under the proposed project, this alternative would impede the SFPUC's ability meet the WSIP level of service objectives for seismic, delivery, and water supply reliability. This alternative would result in all of the same construction- and design-related impacts as the proposed project, and most of the same operational impacts. This alternative would have all the same SU and PSU impacts as the proposed project. However, this alternative

TABLE 8-1
COMPARISON OF THE SIGNIFICANT ENVIRONMENTAL IMPACTS OF THE CEQA ALTERNATIVES

Category of Significant Environmental Impact	Proposed Project (all impacts at LCSD site unless otherwise stated)	No Project Alternative	Lowered Spillway Crest Alternative
Land Use	• PSM impact from temporary construction disruption of residential and recreational land use activities • PSM impact at Sampling Station #5 from temporary disruption of visitors to the Pulgas Water Temple due to construction	All impacts avoided Potential for secondary construction and operational impacts if SFPUC and/or its customers seek supplemental water supplies and would depend on the type and location of the water source	Impacts at LCSD site same as proposed project Impacts at sampling station site avoided
Aesthetics	• PSM impact due to light and glare from nighttime construction • PSM impact from use of vista point for staging area • PSU impact from long term visual effects due to views of dying trees resulting from inundation of shoreline woodlands	All impacts identified for proposed project avoided New impact associated with increased size of "bathtub ring" around the reservoir and interim visual changes while habitat types are adjusting to changed inundation frequencies Potential for secondary construction and operational impacts if SFPUC and/or its customers seek supplemental water supplies and would depend on the type and location of the water source	Same as proposed project, but SM impact from changes in views of the watershed from dying trees could be somewhat reduced
Cultural and Paleontological Resources	• SU impact due to modifications of the LCSD as a historic resource • SU cumulative impact on historic resources in the vicinity of the LCSD • PSM impact due to potential for accidental damage to or destruction of archaeological resources at the LCSD site and Sampling Station #5 • PSM impact due to potential to encounter paleontological resources at the LCSD site and Sampling Station #5 • PSM impact due to potential to encounter human remains at the LCSD site and Sampling Station #5 • PSM impact due to higher reservoir levels that could affect South Crystal Springs Cottage • SU cumulative impacts on cultural resources	All impacts avoided Potential for secondary construction and operational impacts if SFPUC and/or its customers seek supplemental water supplies and would depend on the type and location of the water source	Same as proposed project, except impact on South Crystal Springs Cottage avoided

TABLE 8-1 (Continued)
COMPARISON OF THE SIGNIFICANT ENVIRONMENTAL IMPACTS OF THE CEQA ALTERNATIVES

Category of Significant Environmental Impact	Proposed Project (all impacts at LCSD site unless otherwise stated)	No Project Alternative	Lowered Spillway Crest Alternative
Transportation and Circulation	• PSM impact due to closure of Skyline Boulevard and temporary reduction in roadway capacity and increases in traffic delays • PSM impact due to short-term traffic increases on roadways from construction vehicles and effects on bicycle operations • PSM impact due to increased congestion and closure of Skyline Boulevard that would impair access to land uses and impair emergency access • PSM impact due to increased traffic safety hazards for vehicles, bicyclists, and pedestrians • PSM cumulative impacts from combined and extended increases in construction traffic on local and regional roads	All impacts avoided Potential for secondary construction and operational impacts if SFPUC and/or its customers seek supplemental water supplies and would depend on the type and location of the water source	Same as proposed project
Noise and Vibration	• SU impact from nighttime construction exceeding sleep interference thresholds • SU impact from nighttime noise levels along haul routes near residences • PSU cumulative noise that could exceed speech and sleep interference thresholds • SM impact due to noise increases along south end of Sawyer Camp Trail • PSM impact due to construction noise exceeding speech interference threshold • PSM impact at Sampling Station #5 due to construction noise exceeding speech interference threshold • SM impact because construction noise levels could exceed the San Mateo County Noise Ordinance noise limits • SM impacts from noise levels due to blasting	All impacts avoided Potential for secondary construction and operational impacts if SFPUC and/or its customers seek supplemental water supplies and would depend on the type and location of the water source	Same as proposed project, except impacts at Sampling Station #5 avoided
Air Quality	• PSM impact from nitrogen oxide levels from exhaust emissions exceeding adopted BAAQMD thresholds; SU impact from nitrogen oxide levels from exhaust emissions exceeding BAAQMD's proposed thresholds • SU cumulative impact from exhaust emissions contributing to regional nonattainment status for ozone under BAAQMD's proposed thresholds (LS under adopted thresholds)	All impacts avoided Potential for secondary construction and operational impacts if SFPUC and/or its customers seek supplemental water supplies and would depend on the type and location of the water source	Same as proposed project

TABLE 8-1 (Continued)
COMPARISON OF THE SIGNIFICANT ENVIRONMENTAL IMPACTS OF THE CEQA ALTERNATIVES

Category of Significant Environmental Impact	Proposed Project (all impacts at LCSD site unless otherwise stated)	No Project Alternative	Lowered Spillway Crest Alternative
Recreation	• SU cumulative impact due to combined and prolonged disruption of recreational resources • SM impact from temporary conflicts with established recreational uses	All impacts identified for proposed project avoided Potential for secondary construction and operational impacts if SFPUC and/or its customers seek supplemental water supplies and would depend on the type and location of the water source	Same as proposed project
Utilities and Service Systems	• PSM impact due to potential disruption of existing utilities • PSM impact due to need to relocate existing facilities • PSM impact if excavated material is not used onsite	All impacts identified for proposed project avoided New impact associated with potential impacts on water supply customers of the regional water system Potential for secondary construction and operational impacts if SFPUC and/or its customers seek supplemental water supplies and would depend on the type and location of the water source	Same as proposed project
Biological Resources	• SM impact due to loss of wetlands from construction at LCSD and sampling station sites • SM impact from loss of protected trees during construction • SM impacts on sensitive species during construction at LCSD and sampling station sites • PSM impacts on fisheries due to water quality effects during construction • SM impact during dewatering that could result in disturbance and direct injury of steelhead • PSM impact on fish if blasting is used for demolition and excavation • SM impact due to loss of wetlands from increased maximum normal reservoir level • SM impact due to loss of serpentine grasslands and oak woodlands from increased maximum normal reservoir level	All construction impacts avoided, including impacts at the stilling basin site Operational impacts would occur, but their nature and extent would be different from proposed project; potential for loss of wetlands, but no loss of oak woodlands; impacts on special-status species similar to proposed project but at lower elevations; loss of coldwater and warmwater fishery habitat in Crystal Springs Reservoir, and loss of connectivity to upstream tributaries and spawning habitat Potential for secondary construction and operational impacts if SFPUC and/or its customers seek supplemental water supplies and would depend on the type and location of the water source	Same construction impacts as proposed project Operational impacts would be the same as proposed project, except the impact on oak woodlands above 287.8 feet would be avoided (approximately 12 acres)

TABLE 8-1 (Continued)
COMPARISON OF THE SIGNIFICANT ENVIRONMENTAL IMPACTS OF THE CEQA ALTERNATIVES

Category of Significant Environmental Impact	Proposed Project (all impacts at LCSD site unless otherwise stated)	No Project Alternative	Lowered Spillway Crest Alternative
Biological Resources (cont.)	• SM impact due to loss of oak woodlands from increased maximum normal reservoir levels and short-term exceedances of reservoir levels above 287.8 feet • SM impact from loss of fountain thistle and Marin western flax • SM impact from direct mortality and/or habitat effects on San Francisco garter snake and California red-legged frog • SM impact from loss of oak woodlands and conflicts with local tree ordinance • SM impact due to loss of Pool 1 as potential rearing habitat for juvenile steelhead		
Geology and Soils	• PSM impact due to erosion and loss of topsoil	All impacts avoided Potential for secondary construction and operational impacts if SFPUC and/or its customers seek supplemental water supplies and would depend on the type and location of the water source	Same as proposed project
Hydrology and Water Quality	• PSM impact on water quality due to construction in and adjacent to Crystal Springs Reservoir and San Mateo Creek • PSM impact at Sampling Station #5 due to potential water quality effects from construction	All impacts avoided Potential for secondary construction and operational impacts if SFPUC and/or its customers seek supplemental water supplies and would depend on the type and location of the water source	Same as proposed project, except impacts at Sampling Station #5 avoided
Hazards and Hazardous Materials	• SM impact from the potential to encounter naturally occurring asbestos at the LCSD site • SM impacts from the potential to encounter hazardous building materials at the LCSD site • PSM impact from storage and use of hazardous materials during construction at LCSD and sampling station sites	All impacts avoided Potential for secondary construction and operational impacts if SFPUC and/or its customers seek supplemental water supplies and would depend on the type and location of the water source	Same as proposed project, except impacts at Sampling Station #5 avoided

would lessen some of the significant operational impacts that were identified under the proposed project (impacts on oak woodlands and on aesthetics associated with exceedances). All but one of the same mitigation measures as those identified for the proposed project would be required to reduce the PSM and SM impacts to a less-than-significant level, although the mitigation measure for oak woodlands would be reduced in magnitude. This alternative would obviate the need to raise Sampling Station #5, thereby avoiding all impacts at that site.

Based on the above analysis, the Lowered Spillway Crest Alternative is considered the environmentally superior alternative because it would lessen the significant operational impacts of the proposed project on oak woodlands and aesthetics. However, it would not achieve all of the project's objectives, nor would it fully support the WSIP goals and level of service objectives.

8.5 Alternatives Identification

As part of the alternatives development and analysis for this EIR, the following sources were examined in order to identify potential alternatives to the proposed project: engineering studies conducted by the SFPUC for the proposed project; the scoping process; and other similar EIRs. The results are summarized below.

8.5.1 Engineering Studies

8.5.1.1 Conceptual Engineering Report, Alternatives Analysis

In December 1992, a conceptual engineering report for the Lower Crystal Springs Abutment Protection was prepared for the Utilities Engineering Bureau of the City and County of San Francisco (Leedshill-Herkenhoff, 1992). The report evaluated the following alternatives for structural modifications to the LCSD that would allow safe passage of the PMF:

- Alternative 1: Raise the parapet wall on the upstream crest of the dam and improve the stilling basin.
- Alternative 2: Armor the downstream abutments of the dam and improve the stilling basin.
- Alternative 3: Construct a new training wall or raise the training wall at the downstream crest of the dam.

Alternatives 1 and 2 were both considered feasible, but the third alternative was eliminated at the conceptual stage due to the estimated cost and was not developed sufficiently to determine feasibility. Alternative 1 was selected as the recommended alternative and was eventually modified into the proposed project. In 2007, the SFPUC prepared an addendum to the 1992 Conceptual Engineering Report. The reason for the addendum was to revise the previously developed design to accommodate updated (larger) estimates for the Probable Maximum Flood events. The design concepts are identical to that proposed in the 1992 report and differ only in terms of dimensions of the planned improvements and details of the construction. The addendum proposed further modifications to the earlier preferred alternative, including raising the parapet wall by 9 feet, widening the existing spillway to a 208-foot length ogee spillway, and enlarging the stilling basin (SFPUC, 2007).

The alternatives analysis in this EIR examined only structural improvements that would address the DSOD requirements and did not include proposed reservoir operating conditions. Therefore, consideration of these alternatives is limited to their design aspects, since they do provide alternative strategies or approaches for the operational aspect of the proposed project.

For the purpose of the CEQA alternatives analysis, Alternative 1 is considered equivalent to the proposed project (as described in Chapter 3, Project Description, of this EIR), and Alternative 2 is considered a design alternative that was evaluated for its potential to reduce the identified significant design impacts. However, Alternative 2 was not included for detailed analysis in Section 8.3, above, for the reasons described in Section 8.6, below.

8.5.1.2 Operational Alternatives Analysis

The SFPUC conducted an operational alternatives analysis for the Lower Crystal Springs Reservoir project (Tetra Tech, 2003) to study alternative operations plans for the LCSD and reservoir based on hydrologic scenarios and consideration of both water supply and floodwater storage. The alternatives examined the effects of changing the seasonal maximum and minimum storage elevations in Crystal Springs Reservoir to analyze the tradeoff between water supply and floodwater storage. The following three preliminary operations alternatives were examined:

- Alternative 1: Maximize the flood retention benefits of the additional storage created with the proposed raising of the spillway.
- Alternative 2: Maximize reservoir levels to increase water supply storage and decrease the flood retention portion.
- Alternative 3: Maximize water supply storage in the summer and flood retention capacity in the winter, and minimize impacts on habitat during critical spawning and growth periods.

From the analysis of the three preliminary alternatives, the study resulted in a preferred operation plan that established storage goals for Crystal Springs Reservoir for November 1 and June 1 of each year, and the corresponding end-of-month water elevations in the reservoir ranged from 283.7 to 290.3 feet. The study also included an evaluation of the response of the reservoir to extreme operational and climatic conditions, and concluded that severe impacts on the reservoir (and system deliveries) would occur with major facility outages within the system.

This study provided background data and analysis necessary for the SFPUC to develop the proposed operational plan under the proposed project (described in Chapter 3, Project Description). The study does not offer alternative approaches and strategies that would address the significant environmental impacts of the project identified in Chapter 5 of this EIR. Therefore, none of these alternatives *per se* were considered in the CEQA alternatives analysis.

8.5.2 Scoping Process

As described in Chapter 2, Introduction and Background, the public scoping period for this EIR was conducted to solicit comments from the public and agencies on the appropriate scope and issues to be covered in the LCSDI EIR. No comments were received during the scoping process regarding potential alternatives to the proposed project.

8.5.3 Other EIRs

The WSIP PEIR evaluated seven system alternatives that primarily address the environmental impacts associated with water supply and systemwide operations of the SFPUC regional water system (see Section 8.2, above). Using the information presented in the certified Final PEIR, the SFPUC approved the Phased WSIP, which incorporates elements of three of the alternatives. The LCSDI project, as one component of the WSIP, is incorporated into all of the WSIP alternatives, but, in general, the WSIP alternatives considered systemwide issues rather than project-specific issues. However, as described in Section 8.3.4 above, the Modified WSIP Alternative specifically addressed the LCSDI project, and recommendations from that alternative were incorporated into the proposed LCSDI project. No additional project-specific alternatives were identified in the PEIR.

Two other EIRs on dam upgrades or improvements were reviewed for possible alternative strategies: (1) Calaveras Dam Replacement Project Draft EIR (San Francisco Planning Department, 2009), and (2) EBMUD San Pablo Dam Seismic Upgrade EIR (EBMUD, 2006). Both of these EIRs considered an alternative related to borrow areas and an alternative related to a downstream location of the dam. Neither of these alternative strategies are applicable nor appropriate for the LCSDI project, because the LCSDI does not require any borrow materials for the improvements and also because a downstream location of the LCSD is not feasible. None of the alternatives identified in these other EIRs provided feasible strategies that could attain most of the LCSDI project objectives while reducing significant impacts of the project.

8.5.4 Conclusions

The review of engineering studies conducted for the proposed project, public and agency input in the EIR scoping process, and other similar EIRs resulted in one alternative design concept appropriate for the CEQA alternatives analysis—armoring the downstream abutments of the dam. This alternative was considered but rejected, as described below in Section 8.6. Therefore, the alternative strategies described above in Section 8.3.3 were the only ones used to develop and determine the range of alternatives for detailed analysis in this EIR.

8.6 Alternatives Considered but Rejected from Further Consideration

As part of the background and project development, the following alternative concepts were considered but rejected for the reasons indicated below.

8.6.1 Alternative Locations

8.6.1.1 Enlargement of Calaveras Reservoir

The option of enlarging Calaveras Reservoir was explored as a way to restore the historical storage capacity of Crystal Springs Reservoir at an alternative location. The replacement of the existing Calaveras Dam is another WSIP project currently under environmental review, and this project would restore the historical capacity of Calaveras Reservoir. This alternative would modify the proposed project by enlarging Calaveras Reservoir beyond its historical capacity. However, this alternative was considered in the WSIP PEIR and rejected from further consideration on a systemwide basis because the project would not avoid or reduce the environmental effects associated with increased diversions from the Tuolumne River and would result in more severe environmental impacts on Alameda Creek than the WSIP. Therefore, the alternative of enlarging Calaveras Reservoir beyond its historical capacity was eliminated from further consideration in this EIR as a project-specific alternative to the LCSDI project.

8.6.1.2 Desalination

Another potential alternative approach was to build an offsite desalination facility as a way to provide a water supply source that would replace the local supply provided by the restored historical capacity of Crystal Springs Reservoir. This systemwide alternative strategy was considered in the WSIP PEIR, including a year-round desalination plant in San Francisco and a regional desalination plant for drought supplies. The SFPUC considered these alternatives, but instead approved the Phased WSIP as the preferred water supply and system operations approach. Therefore, an alternative to build a desalination facility was eliminated from further consideration in this EIR as a project-specific alternative to the LCSDI project.

8.6.2 Alternative Design

Abutment Reinforcement Alternative

As part of the conceptual engineering for the LCSDI project, the SFPUC explored several options to the proposed alterations and changes to the LCSD and stilling basin, including reinforcing the existing abutments. This alternative design would consist of armoring the downstream abutments of the LCSD and permitting flow to a depth of 4 feet over the entire parapet wall (Leedshill-Herkenhoff, 1992). It would also include unspecified improvements to the stilling basin. Such action would allow for water flows to overtop the LCSD during high precipitation events without damaging its integrity. This alternative was considered as a potential approach to avoid or lessen the significant and unavoidable impact on historic resources associated with modifications to the LCSD under the proposed project. However, this alternative would include structural modification to the dam abutments and stilling basin, including a concrete apron and concrete apron sidewalls, which would clearly affect the character-defining features that contribute to the historical significance of the LCSD. Compared to the proposed project, this alternative would not avoid or substantially lessen this design impact. In addition, this alternative would not reduce any of the other identified significant impacts (e.g., biological resources). For these reasons, it was determined that this alternative did not warrant detailed analysis in the EIR.

8.6.3 Alternative Construction Approach

Extended Construction Schedule Alternative

As part of project development, the SFPUC considered an 18-month construction schedule to complete the improvements at the top and toe of the dam, compared to the 9-month intensive schedule for substantial completion as proposed for the project. This extended construction schedule would not require nighttime construction activities and would avoid the significant and unavoidable noise impacts associated with nighttime exceedances of the sleep interference criteria and disturbance of nearby residents identified under the proposed project. However, the 18-month construction schedule did not account for the issues related to the vulnerability of the dam's structural integrity during the construction period and the public safety issues associated with a non-functioning spillway and stilling basin during the rainy season. As described above in Section 8.3.3, an intensive 9-month construction period, including nighttime construction work, is required in order to provide adequate dam safety precautions, and any construction scenario that could not achieve substantial completion of the dam and stilling basin improvements between April 15 and November 15 of a single year would be considered infeasible. Therefore, this alternative did not warrant detailed analysis in the EIR.

8.6.4 Alternative Operations

Rebuild the Spillway Crest at an Elevation of 283.8 Feet

Under this alternative, the LCSD would be built to a crest height of 283.8 feet, and the reservoir would be operated at a maximum elevation of 283.8 feet. During the winter season, when rainfall and local watershed runoff occurs, the reservoir would be managed to maintain sufficient available storage and to capture runoff from local storms and to avoid downstream releases.

This alternative would have the same construction and design impacts as the proposed project, as described in Chapter 5 and summarized in Section 8.3.2 above, including the PSU and SU impacts related to historic resources, noise, air quality, and recreation. However, operational impacts on aesthetics, cultural resources, and biological resources would be avoided. Sampling Station #5 would not need to be raised, and therefore all construction impacts at that site would also be avoided.

This alternative would achieve only one of the project objectives and would fail the remaining six objectives. It would comply with the DSOD directive that the LCSD be modified to accommodate the PMF. However, this alternative would not: restore the historical capacity of Crystal Springs Reservoir, improve the SFPUC's water supply delivery capability, help meet the SFPUC's dry-year needs, facilitate maintenance of the regional system, maximize the capture of local runoff, or increase water storage on the Peninsula. In addition, this alternative would not support the WSIP goals and objectives for seismic, delivery, and water supply reliability, and would impede (if not prevent) the SFPUC's ability to achieve the adopted WSIP level of service objectives. Therefore, this alternative was rejected from further consideration in this EIR.

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CHAPTER 9

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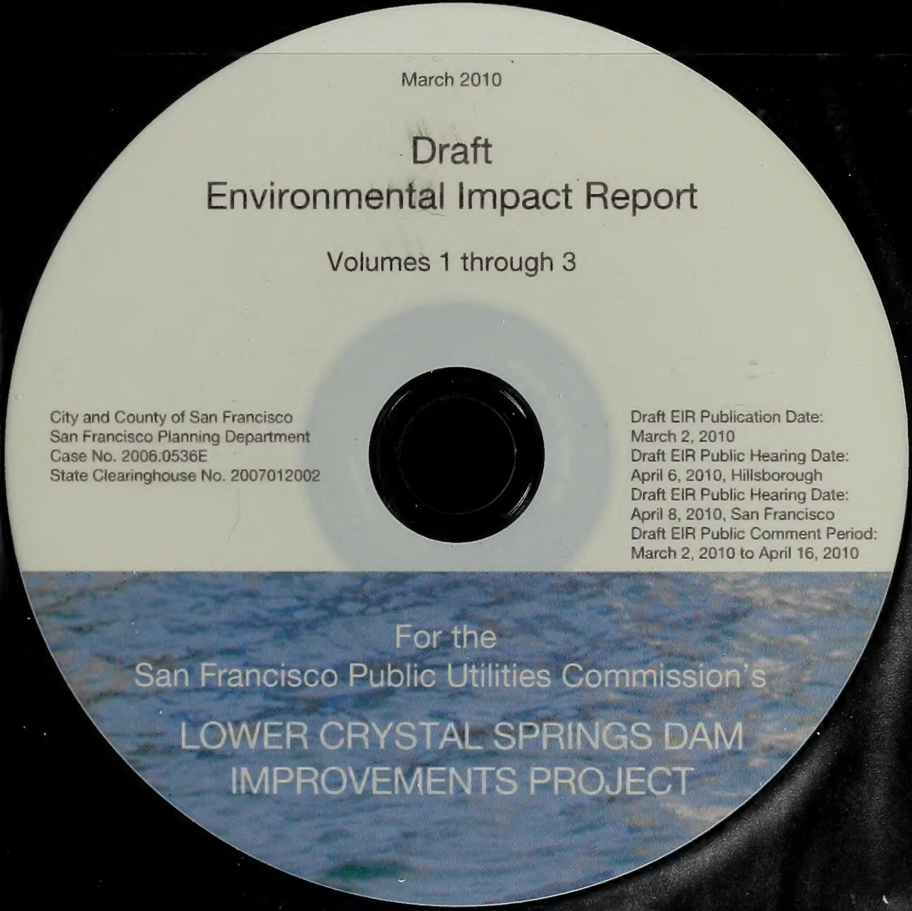

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